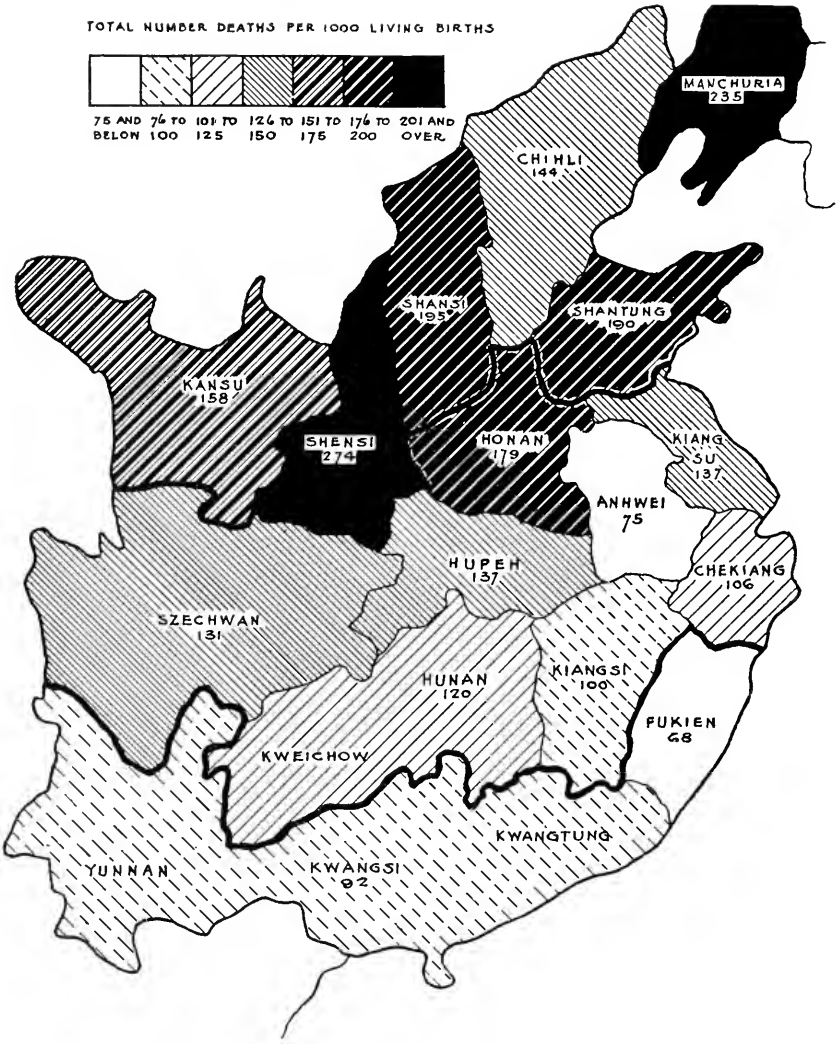


Frontispiece. Mortality of missionary children by provinces. (Illustrating Table 25.) The more heavily shaded the province, the higher is its mortality rate. The figures under the name of the province indicate the number of children dead (of all ages) per 1,000 living births. The heavy lines mark the division into North, Central, and South China used in this study. Honan is included in Central China. Absence of boundary lines between provinces means that in the tabulations these provinces are grouped together.

# THE HEALTH OF MISSIONARY FAMILIES IN CHINA

## A Statistical Study

By
Wm. G. Lennox, M. D.

Department of Economics
University of Denver
DENVER, COLO.
U. S. A.

Acknowledgment

The writer wishes to acknowledge the assistance given by the many missionaries who spent much time and thought in giving of their experiences and advice. Special thanks are due to Dr. H. S. Houghton, through whom the Peking Union Medical College made a contribution of Mex $300, toward the expenses of the study; to Rev. C. L. Boynton, editor of the China Missionary directory; to Professor G. A. Warfield, of the University of Denver, to various mission board officers who have manifested an interest in this study, and to the students, both Chinese and American, who have assisted in the task of tabulation.

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# Tables and Charts

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## TABLES AND CHARTS—*Continued*

## Tables and Charts—*Continued*



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## Illustrations

# The Health of Missionary Families in China*

A Statistical Study by the heads of the families in
collaboration with Wm. G. Lennox, M. D.,
Peking Union Medical College
Peking, China

## Part I—The Health of the Children

### INTRODUCTION

Our first summer in China was one full of anxiety because of the protracted illness, with dysentery, of one of our children. The question, "How can we serve in China, and at the same time safeguard the life and health of the children entrusted to us?" pressed for an answer. Realizing that the question is one which all missionary parents in China must ask, the writer decided to call these parents into consultation in order to get their experience, and to secure the basic facts necessary for a scientific study of the problem.

Let it be said at the outset that this study is the work of the thirteen hundred heads of families who participated in it. The writer has acted merely as a human sorting and tabulating machine. No one could study these personal accounts for two years without gaining deep respect and admiration for the devotion and courage of the isolated and disease-beleaguered missionaries, who count not their lives dear.

"When our child was desperately sick," writes one mother, "and there was no doctor within many days' journey, following James 5:14, we anointed him with oil in the name of the Lord, and prayed to God for his recovery."

No one, let it be said also, could read such accounts of the extremities in which parents have been placed without gaining the strong desire to aid in stopping the preventable, and therefore useless, portion of the sacrifices of life, and of spirit.

* Presented as a thesis for M. A. degree, University of Denver.

### THE VALUE OF CHILD LIFE TO MISSIONS

Why is the health of missionary children of vital importance to the missionary cause?

1. In the missionary army, unlike other armies, wives and children are an integral part of the force. How many missionaries have been forced to the rear because members of the family could not live in the front line trenches? How many more have had their enthusiasm for work or the work itself undermined by the eating anxiety over the sickness or death of children?

2. The children of missionaries, because of their inheritance, and their inborn knowledge of the country, form the most promising of any body of prospective missionary recruits.

3. The existence of an unnecessarily high death rate among children would be a cause of reproach to the missionary body and would deter the enlistment of conscientious married volunteers.

4. It is a well-recognized axiom that in any community, infant and child mortality rates furnish an index to the health of that community. Where infant death rates are high, the mortality of adults is also above normal.

### WHAT THIS STUDY HOPES TO DO

Modern measures for the promotion of health rest on the foundation of vital statistics. The first step in any intelligent effort to improve the health of a community is the collection and digestion of the facts concerning the *present* health of that community. Just so, we can not answer the question of "How conserve the life of our children?" until certain other questions are answered, *e.g.*:

"Do children in China suffer more than their fellows in the homeland?"

"What diseases are most to be feared—for the various sections of China, and for various divisions of the missionary body?"

"At what ages is there greatest danger?"

"What harm, if any, are the clearly preventable diseases doing?"

"What advice can those who have been long years in China give to those who are arriving?"

The answers to these and similar questions will clear the ground for future intelligent action looking toward the better health of the missionary children. Such a study as this is only preparatory. If it does not result in action by missionary boards and by missionaries, the time given to it by the small army of contributors will be lost.

It should be said that the collection of this data was undertaken by the writer on his own responsibility. The results of the study were presented to the conference of the China Medical Missionary Association and received the approval of its members. It should be possible to make such a study as this from mission board records, but most boards have not as yet seen the economy of money and life which would result through a modern system of vital bookkeeping, and health information which they possess is buried in the files. If the information were collected, it would have little to say concerning the children.

Though it is evident that such a study should be in the hands of mission boards, there is a certain advantage of a personal, unofficial collection of data. Many missionaries wrote more frankly than they would to a non-medical committee. The material is for *all* of China and is more uniform than if gathered by separate societies. In the presentation of material the writer takes the view that the Christian forces in China should present a united front and a united program; and that the important facts concerning health conditions should be known by all, so that all may join to build up the weak places.

## METHOD OF COLLECTING DATA

In the fall of 1918 a letter with question blank and return envelope was sent to all the married missionaries listed in the missionary directory. Several circumstances have delayed completion and have prevented one hundred per cent. accuracy of tabulation: (1) Replies continued to come in for more than a year after the questions were sent out. This meant doing over a number of completed tables. Some of the less important ones were not revised. (2) Many blanks were incompletely filled in, figures were inconsistent, or handwriting was open to various interpretations, making accurate tabulation difficult. (3) The work was done without the aid of special mechanical tabulating appliances or of trained clerical assistance. Most of the larger tabulations have been repeated

several times, and results checked, so that it is thought that the amount of error from faulty arithmetic is small.

Securing information concerning family health through a questionnaire has certain limitations. Such a method would not be of value for any but an intelligent group of persons. Because the missionary body is an intelligent one, practiced in answering questionnaires, and realizing the importance of the problem of keeping well, this method of investigation is possible. Of course, certain data is more reliable than other. We can be sure that parents know the number of their children living and dead, and years of marriage. Other items, such as the various sicknesses, dates, etc., will not be so reliable, and for the accuracy of these returns, allowance must be made.

To offset the error which is associated with small bodies of figures, the data obtained has been viewed from many angles.

The writer hopes to present the material in a form intelligible to the missionary body, many of whom are not accustomed to medical terms and mortality tables. To this end, the tables of most practical interest are illustrated by means of charts. In many tables, for the sake of clearness and brevity, only the figures giving the *results* of the computations are put down. Results are expressed usually to the nearest whole numbers only, and wherever possible, comparative results are expressed in percentages.

## GENERAL FACTS CONCERNING DATA

2,220 letters were sent out. Answers concerning 1,300 marriages were received. The facts hereafter tabulated relate to 3,254 children of missionaries, including general facts concerning 36 children of 10 families, furnished by Dr. Elliott Illsgood of the Foreign Christian Society. These 36 are included in certain of the tables, only. All children have lived a total of approximately 28,000 years, nearly 18,000 of which have been spent in China.

Are the statistics obtained representative of the whole of China?

Table 1 represents the percentage of returns from the various provinces. It will be seen that there is considerable variation. Results for provinces near the head of the list will be more reliable than for those near the bottom, as they represent a larger portion of the families in the province.

**Table 1** PERCENTAGE ANSWERING QUESTIONNAIRE BY PROVINCES

| PROVINCE | PER CENT ANSWERING | PROVINCE | PER CENT ANSWERING |
|---|---|---|---|
| Kansu | 93 | Kiangsu | 58 |
| Chekiang | 76 | Shantung | 58 |
| Chihli | 75 | Anhwei | 54 |
| Shansi | 73 | Hunan | 52 |
| Shensi | 70 | Kiangsi | 49 |
| Kweichow | 64 | Hupeh | 49 |
| Fukien | 68 | Kwangtung | 48 |
| Szechuan | 61 | Yunnan | 47 |
| Honan | 58 | Manchuria | 42 |
| | | **All China** | 60 |

**Table 2** PERCENTAGE ANSWERING QUESTIONNAIRE BY SOCIETIES

| SOCIETY | Number to whom Questionnaire was sent | Number Replying | Per cent Replying |
|---|---|---|---|
| Am. Church Mission | 59 | 41 | 80 |
| American Board | 64 | 51 | 80 |
| American Lutheran Societies | 70 | 55 | 78 |
| China Inland Mission | 223 | 159 | 71 |
| English Baptist | 49 | 34 | 70 |
| Y. M. C. A. | 92 | 63 | 68 |
| American Presbyterian, North | 187 | 125 | 67 |
| Canadian Methodist | 71 | 48 | 67 |
| Other American Societies | 332 | 220 | 66 |
| American Baptist, North | 69 | 42 | 62 |
| American Baptist South | 66 | 41 | 62 |
| London Missionary Society | 53 | 31 | 60 |
| American Methodist, North | 125 | 72 | 50 |
| American Presbyterian, South | 59 | 30 | 50 |
| Church Missionary Society | 81 | 40 | 50 |
| European C. I. M. | 91 | 42 | 45 |
| Other European Societies | 158 | 66 | 42 |
| Other English Societies | 270 | 108 | 40 |

Table 2 shows the variation in the representation by societies. The replies range from 40% to 80%—equidistant from the average of 60%. In general the English and European societies have a lower representation than the American. In appraising results, these factors of representation need to be borne in mind.

Very few replies were received from those who were not in China. Presumably the questionnaire did not reach them. If we assume that this number is 15% to 20% of the total, we find that 75% to 80% of the married missionaries at the time in China answered the questionnaire, a high figure, as questionnaires go.

If statistics were available for all the families, in place of the 60% here represented, they would probably show higher sickness and death rates than are here presented. This is because of the fact that the families which have been hardest hit by disease are not now on mission rolls, and consequently were not reached by this questionnaire. Again, of those who are on the mission roll, those who are most interested in the health of their children have been, in all probability, most successful in guarding against disease and are likely to be the ones to answer a questionnaire of this sort. (See Table 32.)

## THE NUMBER OF CHILDREN

### CHILDREN PER MARRIAGE

It is pertinent to inquire whether missionaries have borne their full share of children.

**Table 3** NUMBER OF CHILDREN BORN, NOW LIVING AND NOW DEAD, PER FAMILY OF MISSIONARIES, BY YEARS OF MARRIAGE

| No. of years parents married | No. of families | NUMBER OF CHILDREN | | | | | |
|---|---|---|---|---|---|---|---|
| | | Born | | Now living | | Now dead | |
| | | Total | No. per family | Total | No. per family | Total | No. per family |
| 0–9 | 612 | 984 | 1.61 | 881 | 1.36 | 92 | 0.15 |
| 10–19 | 389 | 1,231 | 3.16 | 1,066 | 2.74 | 159 | 0.42 |
| 20–29 | 162 | 664 | 4.09 | 540 | 3.2 | 130 | 0.86 |
| 30 and over | 57 | 256 | 4.49 | 192 | 3.39 | 62 | 1.08 |
| Years not stated | 80 | 119 | 1.51 | 115 | 1.4 | 10 | 0.12 |
| **Total** | 1,300* | 3,254 | 2.50 | 2,794 | 2.15 | 453 | 0.35 |

*If the 20 second marriages were deducted, the children per family would number 2.54 in place of 2.50

Table 3 gives the number of children born to each family, arranged by the years of the parents' marriage. (Second marriages throughout are counted as separate families.)

Investigations of the Immigration Commission[1] for representative sections of the United States show that native white women whose parents were native, who are under 45 years and have been married from 10 to 19 years, have an average of 2.7 children. Missionaries who have been married the same length of time have an average of 3.16 children.

A more accurate comparison is with a group of American college teachers. Information concerning this group was kindly furnished by the Carnegie Foundation for the Advancement of Teaching, and is summarized in Table 4.

**Table 4** SIZE OF FAMILIES OF FACULTY MEMBERS OF AMERICAN UNIVERSITIES

| RANK OF TEACHERS | Number of families | Total number of children | Average number of children per family | Families with children | |
|---|---|---|---|---|---|
| | | | | Number | Average No. of children |
| Instructors | 635 | 906 | 1.42 | 401 | 2.25 |
| Professors—Intermediate Rank | 1,049 | 2,169 | 2.06 | 839 | 2.58 |
| Full Professors | 1,338 | 3,502 | 2.61 | 1,183 | 2.96 |
| **Total** | 3,022 | 6,585 | 2.18 | 2,414 | 2.68 |

Another fairly just comparison is with American college graduates. Many missionary wives are not college women, but it has been shown that college women have about the same number of children as their female relatives who have not gone to college.[2]

**Table 5** NUMBER OF CHILDREN PER FAMILY FOR VARIOUS GROUPS IN COMPARISON WITH MISSIONARY FAMILIES

| GROUPS | Years of graduation | Number married | Total number children | Average number children |
|---|---|---|---|---|
| Smith College[3] graduates | 1871–1901 | 1,016 | 1,285 | 1.26 |
| Vassar College graduates | 1867–1901 | 961 | 1,579 | 1.64 |
| Bryn Mawr College graduates | 1890–1901 | 178 | 307 | 1.71 |
| Mount Holyoke[4] graduates | 1842–1909 | 974 | 1,973 | 2.02 |
| Total women graduates | 1842–1909 | 3,129 | 5,144 | 1.64 |
| Yale[5] graduates | 1867–1886 | | | 2.02 |
| Faculty members (Table 4) | | 3,022 | 6,585 | 2.18 |
| Missionaries (Table 3) | | 1,300 | 3,254 | 2.50 |

A glance at Table 5 shows that missionary families have a distinctly higher birth rate than these other educated classes. This in spite of the fact that nearly one-half of the marriages of missionaries were concluded less than ten years ago. For the 219 marriages which took place more than 20 years ago, the births average is 4.2.

Among 85 Bryn Mawr[3] graduates who had been married ten years or more, births averaged 2.2. Among 608 missionaries of this class, the number is 3.5.

If childless marriages are deducted, the average children per marriage is as follows: women college graduates, 2.13; college teachers, 2.68; missionaries, 2.80.

**Table 6** NUMBER OF MARRIED YEARS PER LIVING BIRTH BY GROUPS OF SOCIETIES

| Groups of Societies (Those with lowest mortality first) | ALL FAMILIES | | | FAMILIES WITH CHILDREN | | |
|---|---|---|---|---|---|---|
| | Average No. years married | Average No. children | Average No. married years per child | Average No. years married | Average No. children | Average No. married years per child |
| First | 10.2 | 2.14 | 4.7 | 10.7 | 2.50 | 4.2 |
| Second | 10.9 | 2.56 | 4.1 | 11.3 | 2.89 | 3.9 |
| Third | 13.5 | 2.88 | 4.5 | 13.5 | 3.32 | 4.1 |
| **Total** | 11.4 | 2.50 | 4.6 | 12.1 | 2.80 | 4.1 |

The matter of birth rates may be presented in another way. Table 6 shows the average number of married years

per child. The average for all families is 4.6 years. In contrast, among 974 married graduates of Mt. Holyoke College and Seminary,[4] the *child bearing* married years per child number 6.5. That is, births are two years further apart than with missionaries, in spite of the fact that only child-bearing married years are counted.

**Table 7** NUMBER OF CHILDREN PER FAMILY BY SOCIETIES

| SOCIETY* | All Families | | | Families Without Children | | Average No. children of families with children |
|---|---|---|---|---|---|---|
| | Total number | Total No. of children | Average No. of children | Number | Per cent | |
| Am. Bapt., North | 45 | 99 | 2.20 | 5 | 11.01 | 2.47 |
| Am. Ch. Mission | 42 | 78 | 1.85 | 11 | 26.1 | 2.52 |
| Am Meth., North | 73 | 197 | 2.70 | 6 | 8.2 | 2.94 |
| London Mission | 34 | 82 | 2.41 | 2 | 5.8 | 2.56 |
| Y. M. C. A. | 63 | 120 | 1.90 | 7 | 11.1 | 2.14 |
| Other Am. Societies | 233 | 474 | 2.03 | 42 | 18.0 | 2.47 |
| Total 1st group | 490 | 1,050 | 2.14 | 73 | 14.9 | 2.50 |
| Canadian Meth. | 48 | 134 | 2.79 | 3 | 6.2 | 2.97 |
| Ch. Miss. Soc. | 41 | 94 | 2.29 | 8 | 19.5 | 2.87 |
| Am. Pres., North | 126 | 314 | 2.41 | 14 | 11.1 | 2.80 |
| Am. Luth. Societies | 55 | 137 | 2.49 | 9 | 16.4 | 2.99 |
| Am. Board | 53 | 138 | 2.60 | 6 | 11.3 | 2.93 |
| Eng. Bapt. | 34 | 98 | 2.88 | 0 | | 2.88 |
| Total 2nd group | 357 | 915 | 2.56 | 40 | 11.2 | 2.89 |
| Other Eng. Soc. | 108 | 291 | 2.69 | 12 | 11.1 | 3.38 |
| China Inland Mission | 156 | 419 | 2.87 | 25 | 16.0 | 3.42 |
| Am. Pres., South | 29 | 106 | 3.65 | 3 | 10.3 | 4.07 |
| Other European Soc. | 67 | 171 | 2.59 | 10 | 15.1 | 3.05 |
| Am. Bapt., South | 43 | 119 | 2.76 | 7 | 16.2 | 3.30 |
| European C. I. M. | 41 | 139 | 3.39 | 2 | 4.8 | 3.56 |
| Total 3rd group | 444 | 1,275 | 2.88 | 59 | 13.3 | 3.32 |
| Society not stated | 9 | 14 | 1.55 | | | |
| **All societies** | 1,300 | 3,254 | 2.50 | 172 | 13.1 | 2.80 |

*For basis of division into Societies, see explanation following Table 26.

**Table 8** NUMBER OF CHILDREN PER FAMILY, AND PERCENTAGE OF FAMILIES WITHOUT CHILDREN, BY GROUPS OF SOCIETIES OF VARIOUS NATIONS.

| SOCIETIES | All Families | | | | Families without children | | Average children per family having children |
|---|---|---|---|---|---|---|---|
| | Number | Per cent of total | Children | | | | |
| | | | Total number | Average No. per family | No. | Per cent | |
| American Societies | 762 | 59 | 1,782 | 2.33 | 110 | 14.4 | 2.73 |
| English and Canadian | 265 | 20 | 699 | 2.63 | 25 | 9 | 2.91 |
| European | 107 | 8 | 310 | 2.89 | 12 | 11 | 3.26 |
| China Inland | 156 | 12 | 449 | 2.88 | 25 | 16 | 3.42 |

Throughout this study, "Europe" refers to continental Europe.

Because the mission body is composed of many nationalities, the comparison with American statistics is not quite fair. In Table 7, division is made into various societies and groups of societies, and these are, in turn, combined in Table 8, according to the nationality of the societies.

It will be seen (column 3 of Table 8) that English and European societies have more children than American. The average of 2.33 for American societies is not, however, much below the average for the whole—(2.50). This is because the families of American societies comprise nearly 60% of the total.

The statement has been made that the upper class of English society has 2.2 children per family. English and Canadian missionary societies have 2.63 children per family.

### CHILDLESS MARRIAGES

A corollary to this question is the proportion of the marriages which remain childless. In the class of American women of native parentage and married from 10 to 19 years,[1] the percentage is 13.1. Among missionaries married the same length of time it is 6.2, less than half.

All missionaries show 13.1 per cent of the marriages so far childless. Among teachers in American colleges the percentage is 20. Among 3,594 married women graduates of eight American colleges,[3] who had graduated ten or more years previously (classes 1870-1901) the percentage without children is 31.4.

In sharp contrast, missionaries who have been married ten years or more show only 5.9 per cent childless marriages.

These figures are of great interest, as they show (1) that missionaries have not hesitated to assume the responsibilities of parenthood, and (2) the small percentage of infertility in a group of persons in which both parents are free from the sterilizing venereal diseases. ("Gonorrhea is the cause of 70-75 per cent of sterility in married life, not of choice."[5])

It is of interest to inquire not only the average number of children per family, but also the number of children in each family.

## SIZE OF FAMILIES

**Table 9** PER CENT OF FAMILIES WITH SPECIFIED NUMBER OF CHILDREN BORN, BY YEARS OF PARENTS' MARRIAGE

| Number of years parents married | Families | | Per cent of families having specified number of children born | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total number | Per cent of total | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 0–9 | 612 | 46.6 | 17 | 32.7 | 29 | 15.2 | 5.1 | .6 | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 10–19 | 389 | 28.9 | 6.2 | 12.4 | 18.5 | 22.4 | 17.1 | 15 | 5.3 | 1.8 | .5 | .3 | ---- | ---- | .3 |
| 20–29 | 162 | 12.9 | 2.5 | 5.6 | 10.4 | 19.7 | 27.7 | 14.1 | 8.6 | 4.3 | 3.1 | 1.7 | .6 | ---- | .6 |
| 30 and over | 57 | 4.4 | 3.5 | 1.7 | 17.6 | 14.1 | 17.6 | 17.6 | 12.2 | 8.5 | 1.7 | 5.3 | ---- | 1.7 | ---- |
| Years not stated | 80 | 6.2 | 46.2 | 7.5 | 22.5 | 8.75 | 6.3 | 6.3 | 1.3 | 1.3 | ---- | ---- | ---- | ---- | ---- |
| **Total** | 1,300 | 99 | 13.1 | 20 | 22.2 | 17.4 | 12.2 | 7.6 | 3.2 | 1.5 | .74 | .52 | .07 | .07 | .15 |

Table 9 gives the percentage of families having various numbers of children. 101 families have five children, 43 have six, 20 have seven, 9 have eight, 7 have nine, one has ten, one eleven, and two have twelve.

For those married ten years or longer, the largest number (20.9%) have three children, closely followed by those with four children (20%). Table 10 gives the contrasting figures for American college teachers and married graduates of Vassar and Bryn Mawr colleges. In this table the families having more than four children for the various groups are: Vassar and Bryn Mawr graduates, 3.5%; college teachers, 8.5%; missionaries, 13.6%.

**Table 10** SIZE OF FAMILIES OF AMERICAN COLLEGE TEACHERS, OF WOMEN COLLEGE GRADUATES AND OF MISSIONARIES

| GROUPS | Number reporting | Per cent of families having specified number of children born | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Full professors | 1,338 | 12 | 17 | 19 | 24 | 17 | 9 | 3 | .3 | .4 | .2 | .1 | ---- | ---- |
| Professors of intermediate rank | 1,049 | 21 | 16 | 24 | 22 | 12 | 4 | 2 | .1 | .1 | ---- | ---- | ---- | ---- |
| Instructors | 635 | 37 | 15 | 27 | 13 | 6 | 9 | 6 | ---- | ---- | ---- | ---- | ---- | ---- |
| Total college teachers | 3,022 | 20 | 16 | 22 | 21 | 13 | 6 | 2 | .2 | .2 | .1 | .03 | ---- | ---- |
| Graduates of Vassar and Bryn Mawr | 1,703 | 38 | 24 | 19 | 11 | 4 | 2 | .8 | .3 | .1 | ---- | ---- | ---- | ---- |
| Missionaries | 1,300 | 13 | 20 | 22 | 17 | 12 | 8 | 3 | 1.5 | .7 | .5 | .07 | .07 | .15 |

Among the 3,594 college women[3] who graduated ten or more years ago (classes 1881-1901) the percentage with two or more children is 46.3; among missionaries married ten years or more, this percentage is 80. Here again allowance needs to be made for the European societies, among whom the largest families occur.

**Table 11** PERCENTAGE OF FAMILIES WITH SPECIFIED NUMBER OF CHILDREN NOW LIVING, BY YEARS OF PARENTS' MARRIAGE

| Number of years parents married | Number of families | Per cent of families having specified number of children now living | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0–9 | 612 | 19.1 | 35.6 | 29.2 | 12 | 3.8 | .3 | | | | |
| 10–19 | 389 | 8.2 | 14.1 | 22.5 | 23.2 | 18.8 | 9.7 | 1.5 | 1.8 | | |
| 20–29 | 162 | 3.6 | 16.1 | 16.6 | 22 | 21.4 | 10.1 | 3.6 | 4.8 | 1.1 | .6 |
| 30 and over | 57 | 3.5 | 8.8 | 21 | 29.8 | 14 | 5.3 | 10.5 | 5.3 | 1.7 | |
| Years not stated | 80 | 44 | 11 | 22 | 11 | 4.9 | 3.7 | 3.2 | | | |
| **Total** | 1,300 | 15 | 23.8 | 24.7 | 17.4 | 10.9 | 4.8 | 1.3 | 1.3 | .2 | .07 |

Table 11 shows the percentage of families having various numbers of children now living.

**Table 12** PERCENTAGE OF FAMILIES WITH SPECIFIED NUMBER OF CHILDREN NOW DEAD, BY YEARS OF PARENTS' MARRIAGE

| Number of years parents married | Number of families | Per cent of families having specified number of children now dead | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 0–9 | 612 | 87.4 | 10.3 | 2.1 | .1 | | | |
| 10–19 | 389 | 67.8 | 25.3 | 5.3 | .1 | .1 | | |
| 20–29 | 162 | 51.9 | 25.9 | 15.4 | 4.9 | 1.2 | | 6 |
| 30 and over | 57 | 36.8 | 36.8 | 15.6 | 5 | 1.6 | 3.4 | |
| Years not stated | 80 | 92.4 | 3.7 | 2.5 | 1.3 | | | |
| **Total** | 1,300 | 75.2 | 17.5 | 5.3 | 1.3 | .3 | .2 | .1 |

**Table 13** PERCENTAGE OF FAMILIES WITH SPECIFIED NUMBER OF CHILDREN DEAD, BY SOCIETIES

| SOCIETY | Number of families | Per cent of families having specified number of children dead | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Am. Bapt., North | 45 | 87 | 11 | 2 | | | | |
| Am. Ch. Mission | 42 | 86 | 14 | | | | | |
| Y. M. C. A. | 63 | 86 | 12 | 1 | 1 | | | |
| Other Am. Soc. | 223 | 82 | 14 | 3 | .5 | | | |
| London Mission | 34 | 80 | 15 | 4 | | | | |
| Am. Meth., North | 73 | 79 | 19 | 1 | | | | |
| Canad. Methodist | 48 | 77 | 16 | 4 | 2 | | | |
| Am. Pres., North | 126 | 77 | 16 | 5 | 1 | | | |
| Ch. Miss. Soc. | 41 | 76 | 22 | 2 | | | | |
| Am. Luth. Soc. | 55 | 74 | 17 | 6 | 2 | | 2 | |
| Other Eng. Soc. | 108 | 73 | 21 | 5 | | | | |
| Am. Board | 53 | 71 | 19 | 9 | | | | |
| Other European | 66 | 71 | 18 | 4 | 3 | 1.3 | | 1.3 |
| China Inland | 156 | 69 | 19 | 8 | 1.3 | 1.3 | .6 | |
| Eng. Bapt. | 34 | 67 | 20 | 9 | 3 | | | |
| Am. Bapt., South | 43 | 60 | 23 | 12 | | | | |
| Am. Pres., South | 29 | 60 | 27 | 3 | 3 | | | |
| European C. I. M. | 41 | 49 | 27 | 21 | | | | |

Table 12 shows the families having various numbers of children now dead, by years of parents' marriage, and Table 13 shows the same facts by societies.

Three-fourths of all families have had no deaths among children. Of those who have had children die, less than a third have had more than one. Three families have lost four children, three have lost five, and one has lost six. These figures are exclusive of still births.

In Table 13 the societies are arranged in order, with those showing the largest percentage of families without death at the top.

## AGES AND YEARS IN CHINA

**Table 14** CHILDREN—PERCENTAGE OF YEARS IN CHINA, BY PROVINCES

| PROVINCE | Percentage of time in China | PROVINCE | Percentage of time in China |
|---|---|---|---|
| Manchuria | 55.8 | Hupeh | 66.6 |
| Shantung | 66.5 | Hunan | 73.7 |
| Chihli | 69.7 | Kweichow | 83.1 |
| Shansi | 67.1 | Szechuan | 59.4 |
| Shensi | 74.5 | | |
| Kansu | 72.6 | Central China | 68.6 |
| North China | 68.2 | Fukien | 59.9 |
| | | Kwangtung | 56.5 |
| Kiangsu | 72.9 | Yunnan | 72.3 |
| Anhwei | 74.9 | | |
| Chekiang | 79.8 | South China | 58.2 |
| Honan | 66.1 | | |
| Kiangsi | 76.9 | **All China** | 66.9 |

Table 14 shows the percentage of the children's life which has been spent in China, by provinces. Children in South China spend 10 per cent less time in China than those in North and Central China.

**Table 15** NUMBER OF YEARS OF LIFE OF CHILDREN, AND YEARS SPENT IN CHINA, BY SOCIETIES

| SOCIETY | YEARS OF AGE | | | YEARS IN CHINA | | | |
|---|---|---|---|---|---|---|---|
| | Number reported | Total years of age | Average years of age | Number reported | Total years in China | Average years in China | Percentage of time in China |
| Am. Bapt., North | 91 | 827 | 9.09 | 90 | 487 | 5.41 | 59 |
| Am. Church Mission | 73 | 424 | 5.81 | 74 | 209 | 2.82 | 50 |
| Am. Meth., North | 192 | 2,147 | 12.17 | 182 | 1,394 | 7.66 | 65 |
| London Mission | 80 | 856 | 10.69 | 79 | 419 | 5.58 | 48 |
| Y. M. C. A. | 120 | 538 | 4.48 | 120 | 308 | 2 56 | 57 |
| Other Am. Soc. | 426 | 3,101 | 7.27 | 409 | 2,742 | 6.70 | 88 |
| Total 1st group | 982 | 7,893 | 8.03 | 954 | 5,559 | 5.82 | 70 |
| Canadian Methodist | 134 | 692 | 5.16 | 133 | 503 | 3 78 | 73 |
| Church Mission Soc. | 90 | 763 | 8.48 | 89 | 416 | 4 67 | 55 |
| Am. Pres., North | 308 | 2,588 | 8.40 | 304 | 1,737 | 5 71 | 67 |
| Am. Luth. Soc. | 137 | 668 | 4.98 | 137 | 491 | 3.73 | 71 |
| Am. Board Mission | 132 | 1,195 | 9.05 | 137 | 803 | 5.86 | 69 |
| Eng. Baptist | 98 | 997 | 10.18 | 90 | 502 | 5.57 | 59 |
| Total 2nd group | 899 | 6,903 | 7.69 | 890 | 4 452 | 5. | 64 |
| Other Eng. Soc. | 289 | 2,694 | 9.32 | 283 | 1,664 | 5 87 | 62 |
| China Inland Mission | 449 | 4,728 | 10.53 | 440 | 3,391 | 7.70 | 71 |
| Am. Pres., South | 94 | 955 | 10.16 | 95 | 600 | 6.31 | 62 |
| Other European Soc. | 169 | 1,641 | 9.71 | 160 | 946 | 5.90 | 57 |
| Am. Bapt., South | 112 | 1,717 | 15.33 | 109 | 710 | 6 51 | 42 |
| European C. I. M. | 139 | 1 015 | 7.30 | 135 | 623 | 4 61 | 63 |
| Total 3rd group | 1,252 | 12,399 | 9.90 | 1,222 | 7,786 | 6.37 | 63 |
| Society not stated | 14 | 96 | 6.85 | 14 | 91 | 6.50 | 94 |
| Total | 3,149 | 27,291 | 8.65 | 3,030 | 17,888 | 5.8 | 67 |
| Years not stated (Average taken) | 105 | 903 | 8.65 | 174 | 1,009 | 5.8 | 67 |
| **Total all Societies** | 3,254 | 28,194 | 8.65 | 3,254 | 18,897 | 5.8 | 67 |

Table 15 shows the age of children, years in China and percentage of time in China by societies, the societies being arranged in order of mortality of children, with those having the smaller percentage of deaths at the top. The relation of age of children and percentage of time in China to mortality is shown in Figure 12.

In this and some other tables, *e.g.*, Table 26, the number not answering the point in question is entered in the table. In most of the tables, in order to save space, this is not done, so that the total children, total deaths, etc., at the bottom do not in all the tables coincide. As has been pointed out, there is in some tables a small percentage of error due to the fact that almost all the arithmetic was done by head rather than by machine.

**Table 16** NUMBER OF CHILDREN ALIVE, BY AGE AND PROVINCE

| PROVINCE | NUMBER OF CHILDREN LIVING AT SPECIFIED AGE | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All ages | 0-1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-40 | 40 | Age not stated |
| Manchuria | 49 | 5 | ..... | 4 | 3 | 7 | 2 | 3 | 2 | 2 | 4 | 8 | 4 | 4 | 1 | ..... | ..... | ..... | ..... |
| Shantung | 235 | 11 | 14 | 10 | 13 | 12 | 8 | 12 | 6 | 10 | 10 | 31 | 26 | 28 | 7 | 9 | 4 | 3 | 21 |
| Chihli | 229 | 22 | 17 | 21 | 14 | 16 | 9 | 6 | 9 | 9 | 6 | 28 | 21 | 15 | 14 | 10 | 4 | 3 | 1 |
| Shansi | 117 | 7 | 16 | 10 | 6 | 8 | 6 | 5 | 5 | 4 | 5 | 19 | 9 | 8 | 4 | 4 | ..... | ..... | 1 |
| Shensi | 65 | 4 | 3 | 4 | 3 | 5 | 4 | 6 | 3 | 3 | 2 | 12 | 10 | 4 | 2 | ..... | ..... | ..... | ..... |
| Kansu | 174 | 4 | 4 | 5 | 4 | 2 | 4 | 3 | 2 | 2 | 3 | 16 | 7 | 8 | 4 | 4 | 2 | ..... | ..... |
| North China | 769 | 53 | 54 | 54 | 43 | 50 | 33 | 35 | 27 | 30 | 30 | 124 | 77 | 67 | 32 | 27 | 10 | 6 | 23 |
| Kiangsu | 365 | 19 | 23 | 34 | 22 | 24 | 19 | 15 | 21 | 15 | 12 | 64 | 37 | 19 | 18 | 13 | 6 | 4 | ..... |
| Anhui | 75 | 2 | 4 | 4 | 1 | 3 | 5 | 2 | 5 | 3 | 4 | 9 | 20 | 12 | 1 | ..... | ..... | ..... | ..... |
| Honan | 173 | 16 | 22 | 13 | 14 | 10 | 12 | 6 | 11 | 6 | 6 | 27 | 18 | 9 | 2 | 1 | ..... | ..... | ..... |
| Chekiang | 168 | 9 | 6 | 3 | 7 | 11 | 9 | 11 | 5 | 11 | 9 | 35 | 21 | 11 | 5 | 3 | 1 | 1 | ..... |
| Kiangsi | 58 | 6 | 2 | 3 | 3 | 2 | 4 | 3 | 3 | 10 | 4 | 14 | 4 | 7 | ..... | 1 | 2 | ..... | ..... |
| Hupeh | 159 | 13 | 9 | 14 | 14 | 4 | 14 | 9 | 11 | 5 | 10 | 18 | 19 | 15 | 3 | ..... | 1 | ..... | ..... |
| Hunan | 155 | 15 | 5 | 18 | 20 | 12 | 13 | 12 | 14 | 10 | 5 | 23 | 5 | 3 | ..... | ..... | ..... | ..... | ..... |
| Kueichow | 21 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 0 | 2 | ..... | 4 | 2 | 3 | 1 | ..... | ..... | ..... | 2 |
| Szechuan | 258 | 10 | 20 | 21 | 17 | 14 | 25 | 16 | 10 | 13 | 11 | 38 | 23 | 28 | 8 | 3 | 1 | ..... | ..... |
| Central China | 1,432 | 91 | 91 | 112 | 99 | 81 | 102 | 75 | 80 | 75 | 61 | 232 | 149 | 107 | 38 | 21 | 11 | 5 | 2 |
| Fukien | 170 | 17 | 9 | 10 | 8 | 7 | 15 | 8 | 12 | 6 | 8 | 27 | 12 | 14 | 8 | 5 | ..... | ..... | 4 |
| Kwangtung | 274 | 16 | 20 | 27 | 11 | 22 | 14 | 12 | 14 | 14 | 12 | 44 | 23 | 17 | 13 | 1 | 2 | ..... | 12 |
| Yunnan | 19 | 0 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 0 | 2 | 3 | 2 | ..... | ..... | ..... | ..... | ..... | ..... |
| South China | 463 | 33 | 31 | 39 | 21 | 31 | 30 | 22 | 27 | 20 | 22 | 74 | 37 | 31 | 21 | 6 | 2 | ..... | 16 |
| **All China** | 2,664 | 177 | 176 | 205 | 163 | 162 | 165 | 132 | 134 | 125 | 113 | 430 | 263 | 205 | 91 | 54 | 23 | 11 | 41 |

Table 16 gives the number of children now living at various ages, by provinces. The total for each year is represented in Figure 7.

## MASCULINITY

The number of children dealt with is not large enough to make division of statistics into male and female of value. It is of interest, however, to note the relation of total male and female births and deaths. In Table 17 the births and deaths are divided into groups of provinces. Group 3 comprises the provinces having the highest child mortality and Group 1 those with the lowest. In those where the death rate is highest the number of boys born is lowest. Of the total births there are 1,032 boys to 1,000 girls, about the usual proportion. For every 1,000 girls who have died, 1,267 boys have died. This means that the living boys and girls are equal in number—1,310 of the former to 1,312 of the latter.

**Table 17** RELATION OF MALE TO FEMALE BIRTHS, BY GROUPS OF PROVINCES

| GROUP | Total living births | | | Number male births to 1,000 female | Total deaths | | | Number male deaths to 1,000 female |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | Sex not stated | | Male | Female | Sex not stated | |
| 3 | 561 | 573 | 50 | 979 | 110 | 95 | 14 | 1,158 |
| 2 | 572 | 557 | 61 | 1,027 | 87 | 63 | 6 | 1,381 |
| 1 | 414 | 369 | 46 | 1,122 | 40 | 29 | 1 | 1,379 |
| **Total** | 1,547 | 1,499 | 157 | 1,032 | 237 | 187 | 21 | 1,267 |

Twins are reported nineteen times (.6% of the total). In six cases there were twin sons, in seven cases twin daughters, in five cases half and half, and in one case sex was not stated.

## CONDITIONS AFFECTING CHILDREN

There is a variety of conditions which react adversely on foreign children in China. These are, briefly:

(1) Low moral atmosphere—of non-Christian Chinese servants, etc., and, in port cities, of non-Christian foreigners.

(2) Conditions which may affect the nervous poise of the child: isolation, occasionally fright from Chinese mobs, and almost constantly, unnatural tension over food and drink.

"My father is dead," said one child. Quickly her playmate asked, "What did he eat?"

"My," said another little girl, on reaching a Vancouver hotel en route from China, "isn't it grand to take a bath in drinking water?"

(3) Lack of proper educational and social advantages.

(4) Difficulty in maintaining physical health because: (*a*) of climate, sun, lack of space for play; (*b*) because of difficulty in obtaining good fresh milk and other elements of a balanced diet or sufficient vitamins from fruit which is pared and vegetables which are cooked, and (*c*) because of the prevalence of infectious diseases.

All these phases of child life are important. This study is concerned chiefly with the question of physical health.

## COMPARATIVE MORTALITY

### MISSIONARIES AND CHINESE

**Table 18** MORTALITY OF CHILDREN OF MISSIONARIES AND OF LOWER CLASS CHINESE

| CHILDREN OF | Total Births | Number of Deaths | | | Number of Deaths Per 1,000 Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| Missionaries | 3,254 | 451 | 366 | 196 | 139 | 121 | 60 |
| Chinese | 8,468 | 2,751 | 2,203 | 1,321* | 325 | 272 | 156* |

*Number infant deaths unreliable because of Chinese method of counting ages.

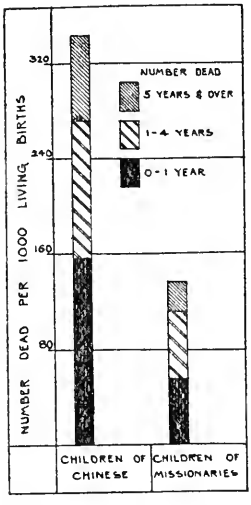


Figure 1. Mortality of Children of Missionaries and of lower class Chinese. (Illustrating Table 18.)

How does the death rate among missionary children compare with that of the Chinese among whom they live? In order to answer this question, the writer[6] had inquiry made of 4,000 male patients who attend the dispensary of the Union Medical College in Peking. Comparative mortality is shown in Table 18 and Figure 1.

How do the rates for children of missionaries and children of non-missionary foreigners compare? The writer knows of no data for children. Statistics for a small number of persons in Africa[7] showed the following number of deaths per 1,000 persons: European officials, 8.10; non-officials, 8.49; missionaries, 31.7.

## MISSIONARIES IN CHINA AND JAPAN

**Table 19** MORTALITY OF MISSIONARY CHILDREN IN CHINA AND IN JAPAN

| COUNTRY | Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Years | Total | 0–5 Years | 0–1 Years |
| China | 3,254 | 451 | 366 | 196 | 139 | 112 | 60 |
| Japan | 377 | 36 | 28 | 20 | 95 | 74 | 53 |

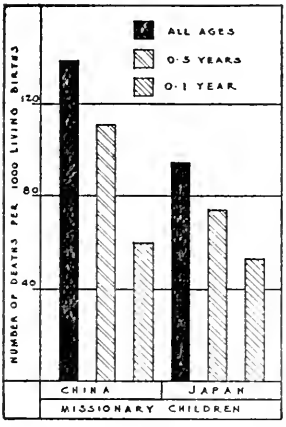


Figure 2. Mortality of missionary children in China and Japan. (Illustrating Table 19.)

How does the death rate among children in China compare with that in other mission fields? The writer has sent a questionnaire to all missionary families in Japan. The answers so far received, as shown in Table 19 and Figure 2, reveal a much lower rate in Japan than in China, the largest difference occurring in children over 1 and under 5 years. Mission doctors in Seoul are making a similar study for missionaries in Korea.

How does the rate among missionary children in China compare with rates in the home lands?

It is hardly fair to compare the missionary group with the general population, for the following reasons: Missionaries are far above the average in education and intelligence; they have passed physical examinations; they are free from the diseases which lie behind such a large proportion of the deaths of children, viz., the venereal diseases and alcoholism.

Another difficulty is that general mortality statistics are based on the number of persons dead to the number living in any geographical or age group for a certain year, whereas in this study births and deaths extend over many years and the number living in any one year is not known.

In order to secure figures for accurate comparison, the writer is at present sending questionnaires similar to those used in China and Japan, to ministers and educated church members in America. A comparison of health conditions in these three groups will be presented in a later paper.

In the meantime, there is some value in comparing results obtained with available government statistics. The missionaries participating in this study have been married an average of 11.4 years. Wherever possible, statistics corresponding to this time period, rather than the latest returns, are used.

## INFANT MORTALITY

First: in regard to infant mortality.

This term means in government statistics the number of infants under one year old who have died in a certain year per 1,000 babies born alive during that same year. In this study it means the number of infants who have died per 1,000 born. Instead of one year, it covers a number of years. There are two sources of error. First, there are 177 infants not yet a year old. Probably five of these will die before reaching a year. This would raise the infant mortality from 60.2 to 61.7, a small difference. The second possible source of error is larger. The parents of 15 babies made the report "Died at birth." It is assumed that these babies were dead when born, and they are therefore classed among the still births. If, however, they were alive when born, they should be classed as infant deaths, and this would raise the infant mortality rate from 60.2 to 64.7. This indefiniteness concerning infants dying at birth is a source of error in most mortality statistics.

**Table 20**

PERCENTAGE OF INFANT DEATHS OCCURRING BY MONTHS FOR UNITED STATES[9] AND VARIOUS CLASSES OF ENGLISH SOCIETY[8], AND FOR MISSIONARY CHILDREN

| | Infant Mortality | Infant Deaths Occurring in Specified Months | | | |
|---|---|---|---|---|---|
| | | Under 1 Mo. | 1–2 | 3–5 | 6–11 |
| | | Percentage | Percentage | Percentage | Percentage |
| Factory laborers in England | 171 | 27 | 18 | 21 | 34 |
| London borough with highest rate | 151 | 24 | 21 | 19 | 35 |
| United States children of native born mothers | 90 | 50 | 17 | 15 | 18 |
| English upper and middle classes | 76 | 39 | 19 | 17 | 24 |
| London borough with lowest rate | 69 | 44 | 21 | 20 | 15 |
| Professional and business group in England | 42 | 50 | 14 | 14 | 22 |
| Missionaries in China | 60 | 34 | 6 | 21 | 39 |

Table 20, Column 1 gives infant mortality rates for various groups of English and American society.

In this comparison, missionary infants show up very well (60 against 42 for the children of English professional and business men). There is a striking difference, however, in the distribution of deaths during the first year, as shown in Table 21 and Figure 3.

**Table 21** INFANT MORTALITY OCCURRING BY MONTHS FOR TWO CLASSES OF ENGLISH SOCIETY[10] AND FOR MISSIONARY CHILDREN

| | Number of Births | Number of Deaths Per 1,000 Births | | | | |
|---|---|---|---|---|---|---|
| | | 0–1 Year | 0–1 Month | 2–3 Months | 4–6 Months | 7–12 Months |
| Factory laborers in England | 80,949 | 171 | 46.3 | 31.7 | 36.4 | 56.8 |
| Professional and business groups in England | 8,658 | 42 | 21 | 6.2 | 6.2 | 8.1 |
| Missionaries in China | 3,204 | 60 | 20.9 | 3.4 | 12.8 | 23.4 |

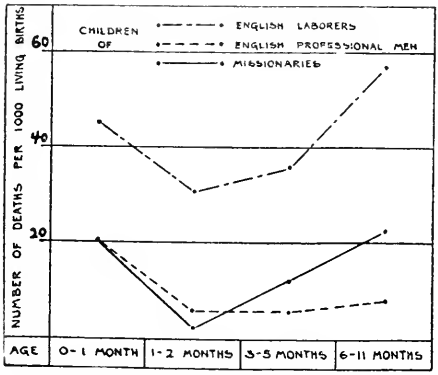


Figure 3. Infant Mortality by Months for two classes of English Society and for missionary children. (Illustrating Table 21.)

In communities where infant death rates are low, a larger proportion of the infant deaths occur in the *first* months of life than in communities where rates are high.[11] (This because of the unpreventable accidents and defects at birth.) Among missionary children, however, 39% of the deaths occur in the *last* half of the year, giving a curve which follows that of English factory laborers. The cause of this upward turn is shown in Table 50. 31 of the 67 deaths during these six months were due to intestinal infection, viz., dysentery, infectious diarrhœa, cholera, and typhoid. Were it not for these infections, the infant rate would nearly equal that of the favored English class, which it actually surpasses for the first six months. Breast-fed babies have no right to these infections. Many mothers complained that they were able to nurse their babies but a few months, which fact, with the consequent artificially prepared food, accounts in large measure for the rising death curve after the first six months. It has been shown that the mortality among bottle-fed infants in New York is 12 times what it is among the breast-fed.[12] The ratio in China, where clean, fresh milk is hard to get, and dysentery is rife, is probably not less. The extent and cause of this inability to nurse needs special investigation. If it is found that too much mission work is responsible, the price paid for that work is a high one.

## MORTALITY IN EARLY CHILDHOOD

The hope aroused by this comparatively low infant mortality of finding a low death rate among children is quickly dashed. In comparing various city rates with the English "Healthy District Life Table," English health officers have shown that children are most affected by an unhealthy environment during the third year of life.[13] From this high point the curve sinks gradually to the tenth year, when unhealthy cities show little more mortality than the "Healthy Districts." This finding is verified in these statistics.

**Table 22** MORTALITY FOR THE FIRST TEN YEARS AMONG MISSIONARY CHILDREN AND AMONG CHILDREN IN AMERICA AND ENGLAND

| Year of Age | Number of Missionary Children Alive at Beginning of Year | Deaths During That Year | Number of Deaths Per 1,000 Living | | |
|---|---|---|---|---|---|
| | | | Children of Missionaries | Children of Native White Parents, U. S. A. 1900 | General Population England and Wales 1904–1908 |
| 0–1 | 3,212 | 194 | 60 | 133 | 117 |
| 1 | 2,841 | 87 | 31 | 32 | 35 |
| 2 | 2,587 | 48 | 18 | 14 | 14 |
| 3 | 2,332 | 17 | 7 | 9 | 9 |
| 4 | 2,147 | 19 | 9 | 7 | 7 |
| 5 | 1,967 | 12 | 6 | 6 | ---- |
| 6 | 1,820 | 15 | 8 | 5 | ---- |
| 7 | 1,673 | 5 | 3 | 4 | ---- |
| 8 | 1,534 | 10 | 6 | 3 | ---- |
| 9 | 1,399 | 4 | 3 | 3 | ---- |

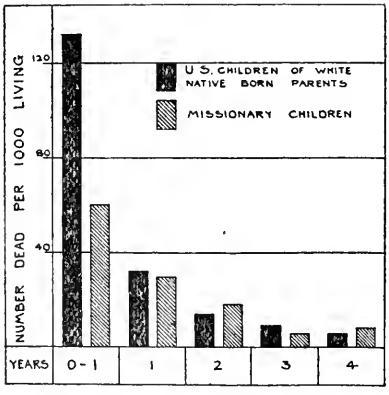


Figure 4. Mortality for the first five years among missionary children and children of white native-born Americans. (Illustrating Table 22.)

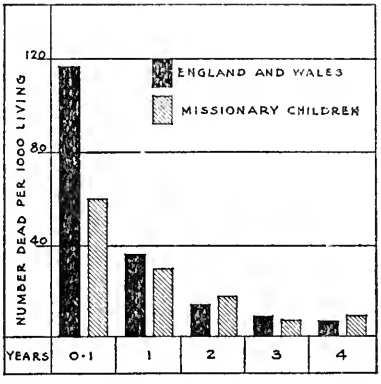


Figure 5. Mortality of the first five years among missionary children and children in England and Wales. (Illustrating Table 23.)

*Infant* deaths, as shown in Table 22 and Figures 4 and 5, for the general population of England[10] and the native white population of the United States,[9] are more than double the missionary rate, but after the first year deaths are about the same.

**Table 23** CHILD AND INFANT MORTALITY IN CITY AND COUNTRY DISTRICTS OF ENGLAND (1914) COMPARED WITH THAT OF MISSIONARY CHILDREN

| | NUMBER OF DEATHS PER 1,000 LIVING | | |
|---|---|---|---|
| | 0–1 Year | 1 Year | 2–3–4 Years |
| County boroughs of North England | 130 | 55.7 | 13.5 |
| Rural districts of South England | 66 | 11.7 | 3.8 |
| Missionary children | 60 | 30.6 | 11.2 |


Figure 6. Mortality in first five years among Missionary Children and children in rural districts of England. (Illustrating Table 23.)

If, as in Table 23, we compare our rates with the cities of North England,[10] we find the same condition, a relatively high rate for missionary children for the ages 2, 3 and 4. If we compare with the rural districts of South England, where infant death rates are nearly as low as missionary, we find that during the second year missionary rates are more than double, and during the third, fourth and fifth years are three times the rates of the country districts of England. This is illustrated in Figure 6. Differences in the methods of arriving at results make comparison of the two curves of more value than comparison of any two points on the two curves. These comparisons show clearly an excessive mortality for the second, third and fourth years of life. These years, rather than the first year, are, compared with the homeland, the dangerous ones for missionary children. These comparisons are made with English and American statistics rather than with European, because only about one-tenth of the children are from European societies. Except for Germany, which has a high rate, infant mortality rates in Northern European countries are lower than those in England and America.

For the five-year period from 1906 to 1910, the following was the infant mortality rate in various countries:[14] United States, 124; England and Wales, 117; Netherlands, 114; Scotland, 112; Denmark, 108; Sweden, 78.

**Table 24** PERCENTAGE OF CHILDREN DYING AND PERCENTAGE NOW LIVING, AT VARIOUS AGES

| AGE | Percentage Dying At Specified Age | Percentage Now Living At Specified Age |
|---|---|---|
| 0–1 | 43.6 | 6.6 |
| 1 | 19.6 | 6.6 |
| 2 | 10.8 | 7.7 |
| 3 | 3.8 | 6.1 |
| 4 | 4.2 | 6.1 |
| 5 | 2.7 | 6.2 |
| 6 | 3.4 | 5. |
| 7 | 1.1 | 5. |
| 8 | 2.2 | 4.7 |
| 9 | .9 | 4.2 |
| 10–19 | 4.2 | 26. |
| 20 and over | 3.8 | 14.4 |
| Total | 100.3 | 99.1 |

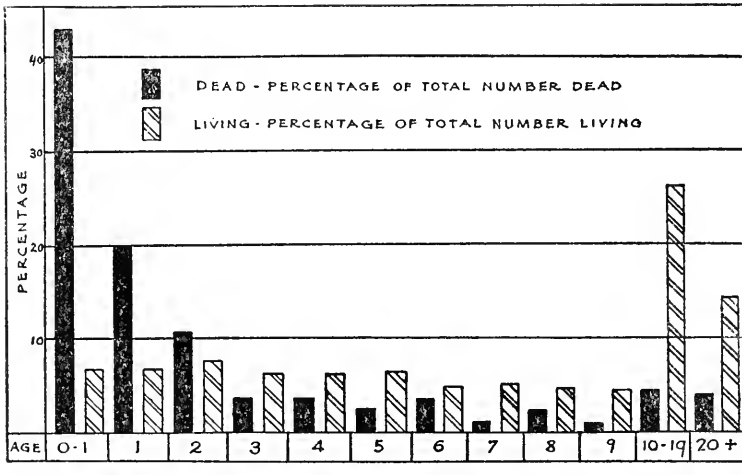


Figure 7. Percentage of children dying and percentage now living at various ages. (Illustrating Table 24.)

Table 24 and Figure 7 show the number of children dying at various ages in relation to the number now living.

## FACTORS IN CHILD MORTALITY

In any analysis of the causes of child mortality, there are numerous factors to be considered. Those on which this study throws some light will be considered first.

## GEOGRAPHICAL LOCATION

In Table 25 is presented the number and percentage (or per thousand) of children dying in the various provinces in which parents reside.

In the cases in which parents have lived in various provinces, their residence is considered to be that in which they have lived longest. This involves some error, as some children have contracted disease while away from home at school. To offset this error and to provide larger figures for generalization, the 18 provinces are grouped into three sections—North, Central, and South China. The basis for this division is the statement of the China Year Book,[15] defining North China as north of the 35th parallel, South China as south of the 28th parallel, with Central China lying between.

Returns from some of the provinces are too small to make tabulation of value. Thus the returns from Yunnan and Kwangsi are included in those from Kwangtung; those from Kueichow with Hunan; and those from Sinkiang and Mongolia with Manchuria.

Western China means practically Szechuan, for returns from other western provinces are scant. The provinces in Table 25 are arranged from north to south.

It will be seen that, in general, the highest rates of mortality are in the northern provinces.

**Table 25** MORTALITY OF CHILDREN BY PROVINCES ARRANGED BY GEOGRAPHICAL SECTIONS

| PROVINCE | Total Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| Manchuria | 85 | 20 | 17 | 9 | 235 | 200 | 106 |
| Shantung | 289 | 55 | 39 | 22 | 190 | 135 | 76 |
| Chihli | 270 | 39 | 32 | 16 | 144 | 118 | 59 |
| Shansi | 154 | 29 | 28 | 24 | 195 | 182 | 91 |
| Shensi | 84 | 23 | 19 | 10 | 274 | 226 | 119 |
| Kansu | 76 | 12 | 7 | 3 | 158 | 92 | 39 |
| North China | 958 | 178 | 142 | 74 | 186 | 148 | 77 |
| Kiangsu | 448 | 61 | 50 | 27 | 137 | 112 | 60 |
| Anhwei | 94 | 7 | 7 | 4 | 75 | 75 | 43 |
| Chekiang | 176 | 19 | 13 | 9 | 106 | 73 | 51 |
| Honan | 229 | 41 | 33 | 16 | 179 | 144 | 78 |
| Kiangsi | 70 | 7 | 6 | 3 | 100 | 82 | 42 |
| Hupeh | 196 | 27 | 19 | 9 | 137 | 97 | 46 |
| Hunan, Kueichow | 216 | 26 | 22 | 11 | 120 | 102 | 50 |
| Szechuan | 311 | 41 | 35 | 19 | 131 | 112 | 61 |
| Central China | 1,740 | 228 | 185 | 98 | 130 | 106 | 56 |
| Fukien | 182 | 12 | 9 | 7 | 68 | 49 | 38 |
| Kwantung, Yunnan | 324 | 30 | 27 | 17 | 92 | 87 | 52 |
| South China | 506 | 42 | 36 | 24 | 83 | 71 | 47 |
| **Total—All China** | 3,204 | 448 | 363 | 196 | 139 | 113 | 61 |

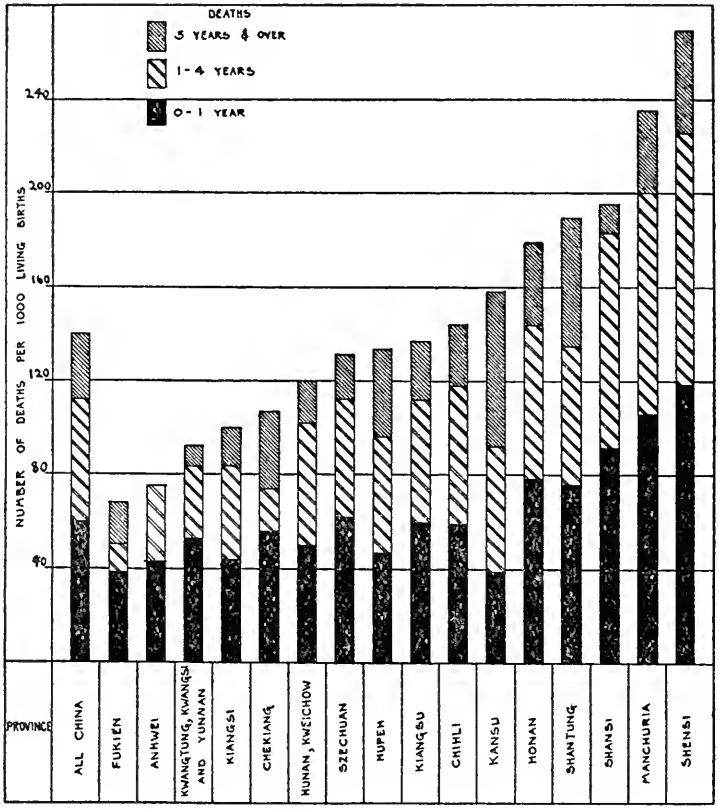


Figure 8. Mortality of Missionary Children by provinces. (Illustrating Table 25.)

Table 25 is illustrated by Figure 8, and also by the frontispiece. Note that provinces with the lowest rates (the first five in the chart) have a relatively small number of children dying between the ages of 1 and 5. In columns representing provinces with high rates this portion is greatly elongated, showing again that this is the danger age for children in China, as compared with those at home. This finding of excessive rates in North China, rather than in the south, was such a surprise that the question has been examined from a number of angles, as will be seen later.

Figure 9 shows the mortality for the three sections of China. To make sure that the high mortality for North China was not due to a longer residence by the children in that section, the number of deaths per 1,000 years of residence was calculated and compared with the mortality rates based on number of births. Figure 10 shows that, viewed from either angle, North China has the highest rates. If Honan were counted with North China, the difference between deaths for North and Central China would be increased by 5 per 1,000 births.

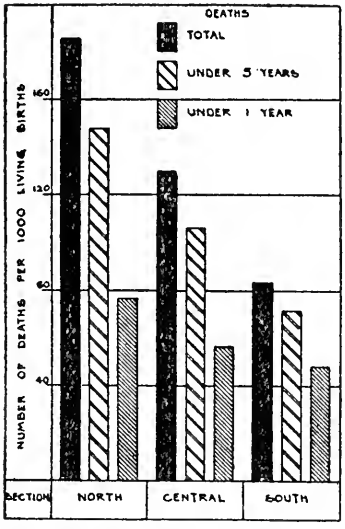


Figure 9. Mortality of children by geographical sections. (Illustrating Table 25.)

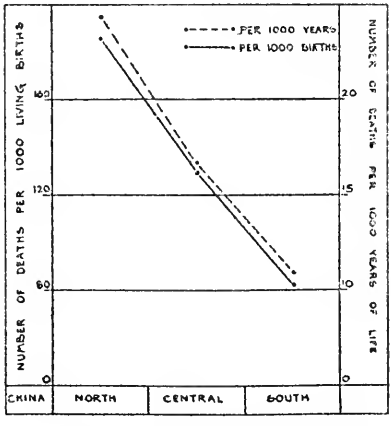


Figure 10. Deaths of children per 1,000 births and per 1,000 years of residence by sections.

## MISSIONARY SOCIETIES

In Table 26 and Figure 11 the tabulation is made according to missionary societies. Societies reporting 75 or more children are listed separately. Societies are arranged in order of the total mortality, the lowest at the top. For further analysis societies are arranged in three groups of six societies each.

**Table 26** MORTALITY OF CHILDREN, BY SOCIETIES

| SOCIETY | Number Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| Am. Baptist, North | 99 | 7 | 7 | 5 | 71 | 71 | 50 |
| Am. Church Mis. | 78 | 6 | 6 | 2 | 77 | 77 | 26 |
| Am. Methodist, North | 197 | 16 | 15 | 7 | 81 | 76 | 35 |
| London Mission | 82 | 7 | 5 | 3 | 86 | 61 | 37 |
| Y. M. C. A. | 120 | 12 | 11 | 8 | 100 | 92 | 66 |
| Other Am. Soc. | 474 | 52 | 39 | 21 | 110 | 82 | 44 |
| Total—1st group | 1,050 | 100 | 83 | 46 | 95 | 79 | 44 |
| Canadian Methodist | 134 | 15 | 14 | 8 | 112 | 104 | 60 |
| Church Mis. Soc. | 94 | 11 | 11 | 7 | 115 | 115 | 78 |
| Am. Pres., North | 314 | 38 | 29 | 14 | 121 | 92 | 45 |
| Am. Lutheran Societies | 137 | 18 | 15 | 5 | 131 | 109 | 36 |
| Am. Board Mis. | 138 | 20 | 15 | 6 | 145 | 108 | 43 |
| Eng. Baptist | 98 | 16 | 14 | 7 | 161 | 142 | 71 |
| Total—2nd group | 915 | 118 | 98 | 47 | 128 | 107 | 51 |
| Other Eng. Soc. | 291 | 40 | 33 | 18 | 172 | 115 | 63 |
| China Inland Mis. | 449 | 80 | 57 | 32 | 178 | 127 | 66 |
| Am. Pres., South | 105 | 20 | 15 | 9 | 190 | 140 | 84 |
| Other European Soc. | 171 | 34 | 30 | 16 | 205 | 175 | 94 |
| Am. Baptist, South | 119 | 27 | 21 | 13 | 228 | 176 | 109 |
| European C. I. M. | 139 | 32 | 29 | 15 | 230 | 209 | 108 |
| Total—3rd group | 1,275 | 233 | 185 | 103 | 182 | 146 | 81 |
| Society not stated | 14 | | | | | | |
| **Total all Societies** | 3,254 | 451 | 366 | 196 | 139 | 112 | 60 |

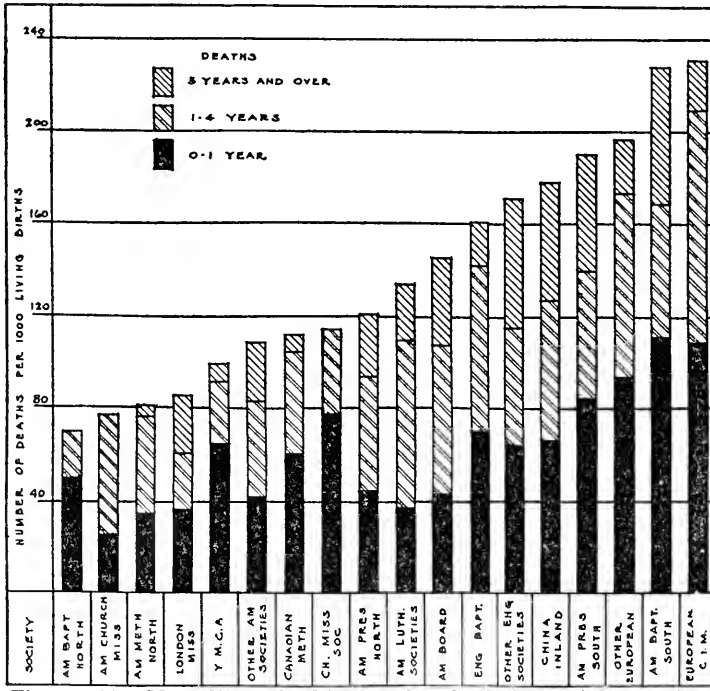


Figure 11. Mortality of children by Societies. (Illustrating Table 26.)

It will be seen that results vary widely. Death rates in the first group are only a little more than one-half what they are in the third. Among 6 societies (5 American and 1 English), of 1,420 children born there is reported an infant death rate of only 41.

Are high death rates the result simply of certain societies having older children or more children than others or the result of keeping them longer in China?

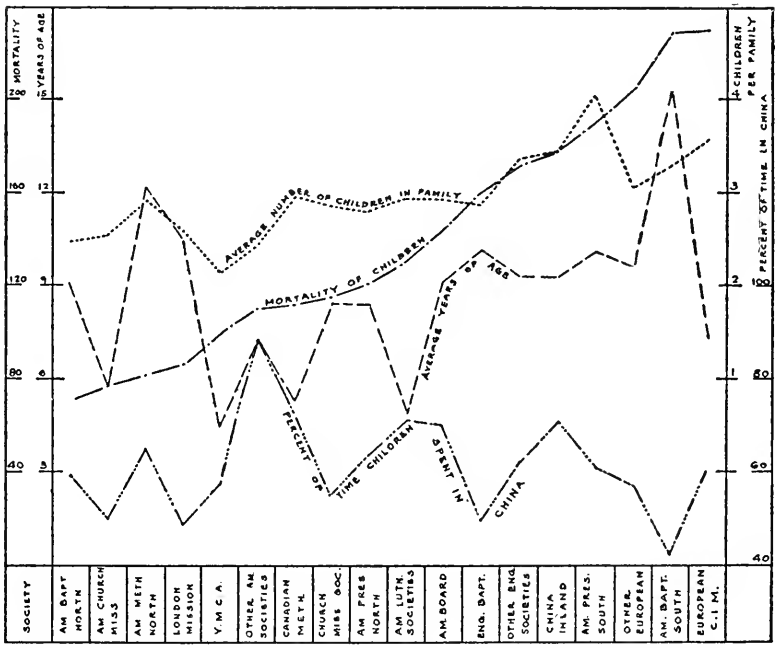


Figure 12. Mortality of children compared with average age of children, average number of children per family, and percentage of time spent in China, by societies. (Illustrating parts of Tables 7, 15, and 26.)

Figure 12 compares these factors graphically. None of the lines parallel the line expressing the total mortality. Though age of children may modify figures in certain cases, (*e.g.*, we might say that the American Methodist and London missions have a low mortality *in spite* of having older children, and the Southern Baptist a high rate *because* of this

factor), yet age of children is not a predominant factor. The line representing the size of the families *does* rise fairly constantly with the mortality line. The percentage of time spent in China has little influence. One would not expect it to, for children are rarely sent home before seven years of age, by which time 88% of the deaths have occurred. It is the reverse, naturally enough, of the curve expressing the average age of children, for the older the child the more time has he spent at school outside of China.

Societies reporting less than 75 children each are put into five different groups, following national rather than denominational lines. The groups, with the societies in each, are as follows. The numbers refer to the number of families reporting:

1. **Other American Societies**—Seventh Day Adventist, 31; Christian Missionary Alliance, 21; Reformed Church in America, 12; Methodist Episcopal South, 11; United Evangelical Church Mission, 11; Foreign Church Mission Society, 10; Church of the Brethren, 10; Yale Mission, 9; China Mennonite Mission, 9; American Reformed Presbyterian, 8; China Medical Board, 6; other societies, 6; Canton Christian College, 5; Independent Missions, 5; United Brethren in Christ, 5; American Advent Christian Mission, 4; American Bible Society, 3; American Free Methodist, 3; University of Nanking, 1; Baptist College, Shanghai, 1; South Chihli Mission, 4; Assemblies of God, 4; Pentecostal Church of Nazarene, 4; Church of God, 3; National Holiness Mission, 3; Apostolic Faith Mission, 2; Seventh Day Baptist Mission, 1; Methodist Protestant Mission, 1; American Friends Mission, 1; Ebenezer Mission, 1; Grace Mission, 1; Hebron Mission, 1; North Chihli Mission, 1; Tsehchowfu Mission, 1; China New Testament Mission, 1; Glad Tidings Mission, 1; Evangel Press, 1; South German, 2; Peniel Mission, 1.

2. **American Lutheran Societies**—Norwegian Lutheran Church in America, 27; Augustana Synod Mission, 10; Swedish American Mission, 7; American Lutheran Brethren, 5; Lutheran Board of Missions, 5; Evangelical Lutheran Synod of Missouri, etc., 3.

3. **Other English Societies**—Canadian Presbyterian, 19; Wesleyan Methodist Mission, 17; Christian Missions in Many Lands, 10; British and Foreign Bible Society, 10; English Presbyterian, 9; United Methodist Mission, 8; United Free Church of Scotland, 8; Church of England Mission, 7; Irish Presbyterian, 6; Friends Foreign Mission, 2; Salvation Army, 3; Canadian Church Mission, 2; Church of Scotland, 2; Miscellaneous, 2; National Bible Society, Scotland, 1; Canadian Holiness Mission, 1.

4. **European Societies Associated with China Inland Mission**—Scandinavian China All. Mission, 11; Swedish Mission in China, 10; Liebenzell Mission, 5; German China All. Mission, 5; Swedish Holiness Mission, 5; Swedish Alliance Mission, 4; Norwegian Mission in China, 1; Norwegian Alliance Mission, 1.

5. **Other European Societies**—Basel Mission Society, 15; Swedish Mission Society, 12; Danish Lutheran Mission, 11; Norwegian Lutheran Mission, 7; Norwegian Mission Society, 6; Berlin Mission Society, 5; Finland Missionary Society, 5; Swedish Baptist Mission, 4; Free Evangelical Mission of Norway, 1; Kiel China Mission, 1; Rhenish Mission Society, 1.

**Table 27** MORTALITY OF CHILDREN
IN SOCIETIES REPORTING BETWEEN 20 AND 75 CHILDREN

| SOCIETIES | Total Births | Number Dead | | | Number Dead Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| Am. Educational Institutions | 53 | 3 | 3 | 1 | 57 | 57 | 19 |
| Christian and Miss., All | 51 | 4 | 4 | 1 | 78 | 20 | 20 |
| Am. Methodist, South | 46 | 5 | 5 | ------ | 109 | 109 | ------ |
| Seventh Day Adventists | 43 | 4 | 4 | 3 | 93 | 93 | 70 |
| Reformed Ch. in Am. | 43 | 1 | 1 | 1 | 23 | 23 | 23 |
| Foreign Christian Miss.* | 99 | 8 | 7 | 4 | 80 | 70 | 40 |
| Lutheran United Miss. | 72 | 8 | 6 | ------ | 111 | 83 | ------ |
| Swed. Am. Miss. Cov. | 20 | 5 | 5 | 2 | 250 | 250 | 100 |
| Augustana Synod | 20 | 1 | 1 | 1 | 50 | 50 | 50 |
| Scandinavian All. Miss. | 43 | 15 | 12 | 6 | 35 | 28 | 14 |
| Swedish Miss. in China | 34 | 5 | 5 | 2 | 176 | 176 | 59 |
| Canadian Pres. | 67 | 14 | 12 | 7 | 209 | 179 | 104 |
| Wesleyan Meth. | 41 | 6 | 5 | 1 | 146 | 122 | 24 |
| Brit. and For. Bible Soc. | 29 | 2 | 1 | ------ | 69 | 34 | ------ |
| Ch. of Scotland | 27 | 5 | 2 | 2 | 185 | 74 | 74 |
| United Meth. | 24 | ----- | ----- | ----- | ----- | ----- | ----- |
| Ch. Miss. in Many Lands | 21 | 5 | 5 | 3 | 238 | 238 | 143 |
| Danish Luth. Soc. | 34 | 11 | 11 | 4 | 324 | 324 | 118 |
| Swedish Miss. Soc. | 32 | 6 | 4 | 2 | 188 | 156 | 63 |
| Basel Miss. | 29 | 3 | 3 | 0 | 103 | 103 | 0 |

*Facts concerning 36 children supplied by Dr. Illsgood not detailed enough to allow this society a seperate place in tables.

In Table 27 is shown the data for societies reporting between 20 and 75 children. The numbers dealt with are too small to be of value, but the table is inserted for the benefit of those who may be interested.

## SOCIETIES IN RELATION TO LOCATION

An important question now arises. Is the poor showing made by some of the societies due to geographical location?

**Table 28** PERCENTAGE OF CHILDREN LIVING IN SECTIONS OF CHINA
BY SOCIETIES

| SOCIETY | PERCENTAGE OF CHILDREN LIVING IN | | |
|---|---|---|---|
| | North China (Including Honan) | Central China | South China |
| Am. Bapt., North | ------ | 63 | 36 |
| Am. Church Mis. | ------ | 100 | ------ |
| Am. Meth., North | 32 | 39 | 28 |
| London Mission | 32 | 32 | 36 |
| Y. M. C. A. | 32 | 51 | 17 |
| Other Am. Soc. | 25 | 58 | 17 |
| Total—1st Group | 23 | 56 | 21 |
| Canadian Methodist | ------ | 100 | ------ |
| Church Mis. Soc. | ------ | 53 | 47 |
| Am. Pres., North | 39 | 38 | 22 |
| Am. Luth. Societies | 60 | 40 | ------ |
| Am. Board Mis. | 67 | ------ | 33 |
| Eng. Baptist | 100 | ------ | ------ |
| Total—2nd Group | 43 | 39 | 17 |
| Other Eng. Soc. | 37 | 45 | 18 |
| China Inland Mis. | 36 | 61 | 3 |
| Am. Pres., South | ------ | 100 | ------ |
| Other Europ. Soc. | 44 | 29 | 27 |
| Am. Bapt., South | 51 | 35 | 14 |
| European C. I. M. | 77 | 23 | ------ |
| Total—3rd Group | 40 | 49 | 9 |
| Total All Societies | 35 | 48 | 15 |

In Table 28 is shown the percentage of children reported from North, Central, and South China by each of the societies. In this and the following table Honan is included in North China. This is done to make the numbers more nearly even, and also because Honan's mortality rate approaches the average for North China more nearly than that for Central China.

Table 28 shows that geographical location does have some effect on society mortality. In the first group (with lowest mortality), 21% of the children are in favored South China; in the second group, 17%, and in the third group, only 9%. This factor, of course, is only one of many, but it may help to explain the position of some of the societies in the table. For example, the English Baptist group might be higher up the list were not all the children in North China. American Baptist North and South might be nearer together did they not belie their names. The Southern Baptists have nearly a half of their children in North China, while the Northern Baptist have none of their workers in the north.

Another question arises. Possibly the reverse of the foregoing assumption is true. Possibly the relatively high mortality rates from North China are due to the societies working there, and not to the unusual prevalence of disease.

To answer this question, the mortality from North, Central, and South China for each society was calculated.

Within each society we may expect to find mortality fairly constant, the geographical location being the variable which should modify results. Unfortunately, division into such small groups reduces the numbers below the point where great reliance can be placed on them.

**Table 29** MORTALITY OF CHILDREN BY SOCIETIES, AND BY SECTIONS OF CHINA

| SOCIETY | Section | Total Number Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| Am. Bapt., North | North | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| | Central | 63 | 6 | 6 | 4 | 95 | 95 | 63 |
| | South | 36 | 1 | 1 | 1 | 28 | 28 | 28 |
| Am. Meth., North | North | 66 | 8 | 7 | 3 | 121 | 106 | 45 |
| | Central | 74 | 5 | 5 | 3 | 68 | 68 | 41 |
| | South | 57 | 3 | 3 | 1 | 53 | 53 | 18 |
| London Mission | North | 26 | 1 | 1 | 0 | 38 | 38 | 0 |
| | Central | 26 | 4 | 3 | 2 | 154 | 115 | 77 |
| | South | 30 | 2 | 1 | 1 | 67 | 33 | 33 |
| Y. M. C. A. | North | 38 | 4 | 4 | 2 | 105 | 105 | 53 |
| | Central | 61 | 8 | 7 | 6 | 131 | 115 | 98 |
| | South | 21 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ch. Miss. Soc. | North | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| | Central | 50 | 7 | 7 | 3 | 140 | 140 | 60 |
| | South | 44 | 4 | 4 | 4 | 91 | 91 | 91 |
| Am. Pres., North | North | 124 | 14 | 10 | 5 | 113 | 80 | 40 |
| | Central | 122 | 15 | 12 | 4 | 123 | 98 | 33 |
| | South | 68 | 9 | 7 | 5 | 132 | 104 | 75 |
| Am. Board | North | 92 | 17 | 14 | 5 | 185 | 152 | 54 |
| | Central | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| | South | 46 | 3 | 1 | 1 | 65 | 22 | 22 |
| Other Am. Soc. | North | 110 | 21 | 14 | 6 | 199 | 127 | 55 |
| | Central | 254 | 23 | 18 | 8 | 91 | 71 | 32 |
| | South | 74 | 6 | 6 | 4 | 81 | 81 | 54 |
| Am. Luth. Societies | North | 82 | 7 | 6 | 2 | 85 | 73 | 24 |
| | Central | 55 | 11 | 9 | 3 | 200 | 164 | 54 |
| | South | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Other Eng. Soc. | North | 141 | 27 | 23 | 15 | 191 | 163 | 106 |
| | Central | 93 | 13 | 9 | 3 | 140 | 97 | 32 |
| | South | 56 | 2 | 2 | 1 | 36 | 36 | 19 |
| Other European Soc. | North | 75 | 24 | 21 | 12 | 320 | 240 | 160 |
| | Central | 49 | 6 | 5 | 4 | 123 | 102 | 82 |
| | South | 47 | 4 | 4 | ---- | 85 | 85 | ---- |
| European C. I. M. | North | 109 | 17 | 17 | 8 | 156 | 156 | 74 |
| | Central | 32 | 5 | 5 | 2 | 156 | 156 | 62 |
| | South | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| China Inland Mission | North | 164 | 41 | 31 | 17 | 255 | 189 | 104 |
| | Central | 272 | 39 | 26 | 15 | 143 | 96 | 54 |
| | South | 12 | ---- | ---- | ---- | ---- | ---- | ---- |
| Am. Bapt., South | North | 61 | 13 | 9 | 5 | 213 | 144 | 82 |
| | Central | 41 | 9 | 8 | 5 | 219 | 195 | 122 |
| | South | 17 | 5 | 4 | 3 | 299 | 235 | 176 |

In nine of the fourteen societies mortality rates decreased progressively from north to south. In four, on the other hand, they increased. In one (the Y. M. C. A.) Central China showed higher rates than either North or South China.

From this analysis we can conclude that geographical location in itself helps to determine mortality, but that it is not the only factor in determining the death rates for societies. It should be remembered that many societies in North China, particularly in Shensi, Manchuria and Mongolia, are doing difficult pioneer work. In all frontier communities, death rates among children are high.

In later tables further light will be thrown on the cause for the high rates in North China.

## SIZE OF SOCIETIES

Table 30 MORTALITY OF CHILDREN
WITH REFERENCE TO SIZE OF MISSIONARY SOCIETIES

| Societies Reporting Following Number of Children | Number of Living Births | Number of Deaths | | | Number of Deaths Per 1 000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| More than 75 (13 societies) | 2,028 | 275 | 220 | 121 | 135 | 108 | 60 |
| Between 20 and 75 (20 societies) | 753 | 104 | 86 | 37 | 138 | 114 | 50 |
| Less than 20 (60 societies) | 418 | 67 | 55 | 34 | 160 | 131 | 81 |

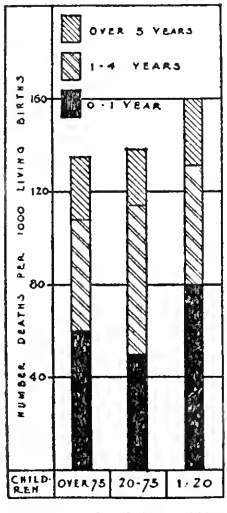


**Figure 13. Mortality of children by size of missionary societies. (Illustrating Table 30.)**

As seen in Table 30 and Figure 13, there is little difference in death rates for societies reporting between 20 and 75 children, and those reporting over 75. The rates are increased, however, for the 60 small societies reporting less than 20 children apiece.

## NATIONALITY OF SOCIETIES

In Table 31 and Figure 14 is shown the mortality according to the country in which the head office of the society is located. "Great Britain" includes Ireland, Scotland and Australia. The China Inland Mission is classed separately, as it has offices in various countries. "Europe" includes the European missions associated with the China Inland Mission.

**Table 31** MORTALITY OF CHILDREN BY NATIONALITY OF SOCIETIES

| MISSION OFFICE LOCATED IN | Number of Living Births | Percentage of Total | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| America | 1,732 | 55 | 216 | 173 | 90 | 122 | 97 | 51 |
| Great Britain | 490 | 15 | 60 | 51 | 28 | 122 | 104 | 57 |
| Canada | 209 | 6 | 29 | 26 | 15 | 139 | 124 | 72 |
| (China Inland) | 449 | 14 | 80 | 57 | 32 | 178 | 129 | 71 |
| Total outside Europe | 2,930 | 90 | 385 | 307 | 165 | 131 | 105 | 56 |
| Europe | 310 | 10 | 66 | 59 | 31 | 213 | 190 | 100 |

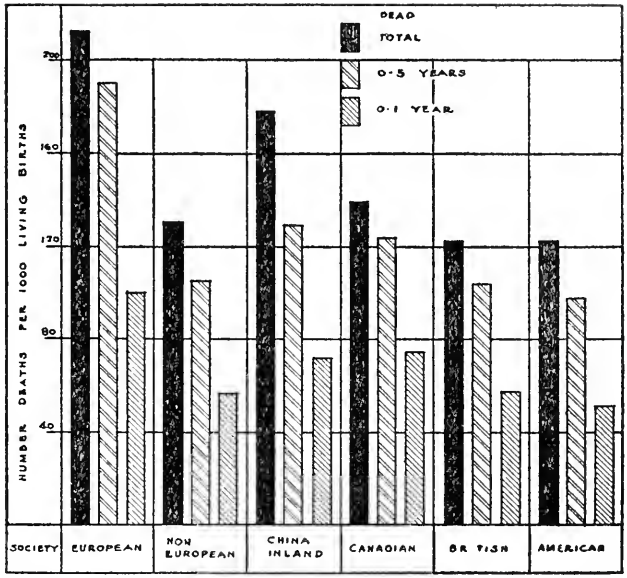


Figure 14. Mortality of children by nationality of missionary societies. (Illustrating Table 31.)

## BIRTHPLACE OF PARENTS

**Table 32** MORTALITY OF CHILDREN, BY BIRTHPLACE OF PARENTS

| PARENTS BORN | Total Number Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | Under 5 Years | Under 1 Year | Total | Under 5 Years | Under 1 Year |
| 1. One or both born in China | 176 | 16 | 12 | 8 | 100 | 68 | 45 |
| 2. Both born in United States | 701 | 84 | 72 | 37 | 120 | 100 | 53 |
| 3. Father and mother born in different countries | 311 | 40 | 31 | 13 | 129 | 100 | 42 |
| 4. Both born in Great Britain or Colonies | 491 | 71 | 58 | 31 | 144 | 118 | 63 |
| 5. Both born in Europe | 218 | 46 | 39 | 19 | 212 | 180 | 87 |
| **Total** | 1,897 | 257 | 205 | 108 | 125 | 108 | 57 |
| Birthplace not stated | 1,307 | 191 | 158 | 88 | 147 | 121 | 68 |

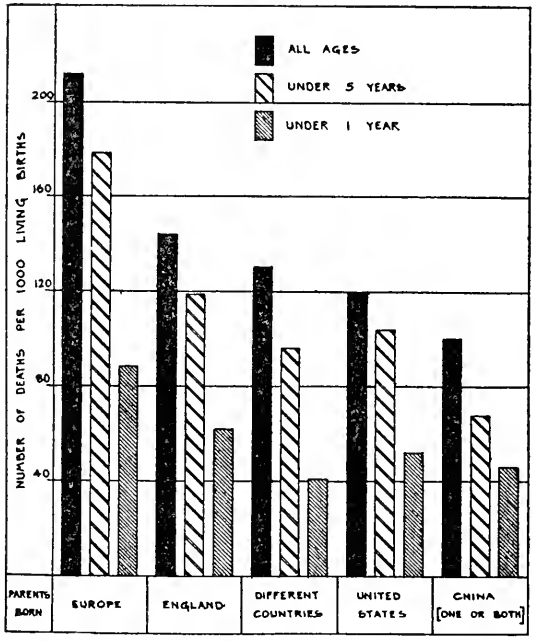


Figure 15. Mortality of children by birthplace of parents. (Illustrating Table 32.)

Table 32 and Figure 15 show the mortality of children according to the birthplace of parents. The group with the lowest mortality is the one in which one or both parents were born in China. Is this because of acquired resistance to disease, or because of better knowledge of the means of prevention?

In this table, again, children of continental European parentage show the highest mortality. This tabulation is incomplete, because in two-fifths of the questionnaires the birthplace of parents was not stated. Children of parents who did not fill the blanks in detail show a higher death rate than children of those who did. This would seem to show that those who are most interested in an investigation of this sort are also more successful in preventing sickness and death among their children.

## MEDICAL TRAINING OF PARENTS

Investigators agree that an important factor in child mortality is the intelligence of parents concerning medical matters. If in this study, children of doctors and nurses have a lower mortality than others, it will be an argument for more extensive education of missionaries in matters of health. If, on the other hand, they do not show a distinctly lower mortality, not much can be hoped for from this quarter. Table 33 and Figure 16 show the results of this tabulation.

**Table 33** MORTALITY OF CHILDREN BY MEDICAL TRAINING OF PARENTS

| | Total Number Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| Father a doctor | 379 | 47 | 42 | 25 | 124 | 111 | 65 |
| Mother a doctor or nurse | 252 | 23 | 21 | 14 | 91 | 83 | 55 |
| Both parents medically trained | 146 | 11 | 8 | 4 | 75 | 54 | 27 |
| **Total** | 777 | 81 | 71 | 43 | 104 | 91 | 56 |
| Neither parent medically trained | 2,427 | 367 | 292 | 153 | 151 | 120 | 63 |

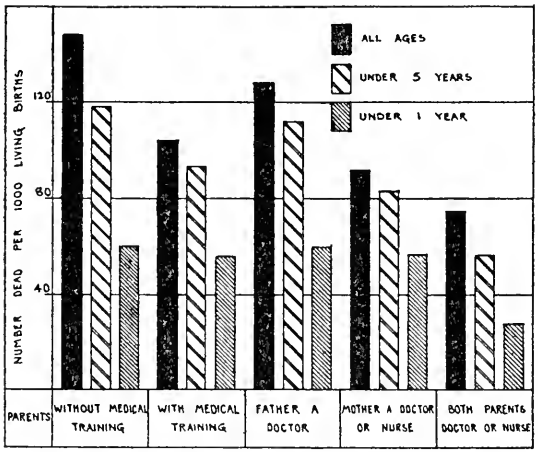


Figure 16. Mortality of children by medical training of parents. (Illustrating Table 33.)

The education of the mother seems to have greater influence than that of the father, though results are best when both are trained. This would indicate that home sanitation is of more importance than medical treatment. It would point the particular value, also, of education of the wife in hygiene and the elements of preventive medicine. Note that infant mortality differs but little between the trained and untrained.

The big difference comes after the first year. Families in which both parents have training show the remarkably low infant mortality rate of 27.

In this tabulation only those parents who have had at least three-fourths of medical or nursing training are included among the trained. Those with partial training were too small a class to make calculation of the mortality rate of value.

**Table 34** MORTALITY OF CHILDREN BY MEDICAL TRAINING OF PARENTS AND BY SECTIONS OF CHINA

| SECTION | Total Number Born | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | Under 5 Years | Under 1 Year | Total | Under 5 Years | Under 1 Year |
| PARENTS WITH MEDICAL TRAINING | | | | | | | |
| North | 209 | 24 | 20 | 9 | 115 | 95 | 43 |
| Central | 425 | 49 | 44 | 27 | 115 | 103 | 64 |
| South | 134 | 10 | 8 | 7 | 75 | 59 | 52 |
| **Total with Training** | 768 | 83 | 72 | 43 | 108 | 93 | 56 |
| PARENTS WITHOUT MEDICAL TRAINING | | | | | | | |
| North | 749 | 154 | 122 | 65 | 205 | 162 | 86 |
| Central | 1,315 | 180 | 141 | 71 | 137 | 107 | 54 |
| South | 372 | 32 | 28 | 17 | 86 | 75 | 45 |
| **Total without Training** | 2,436 | 366 | 291 | 153 | 149 | 119 | 62 |

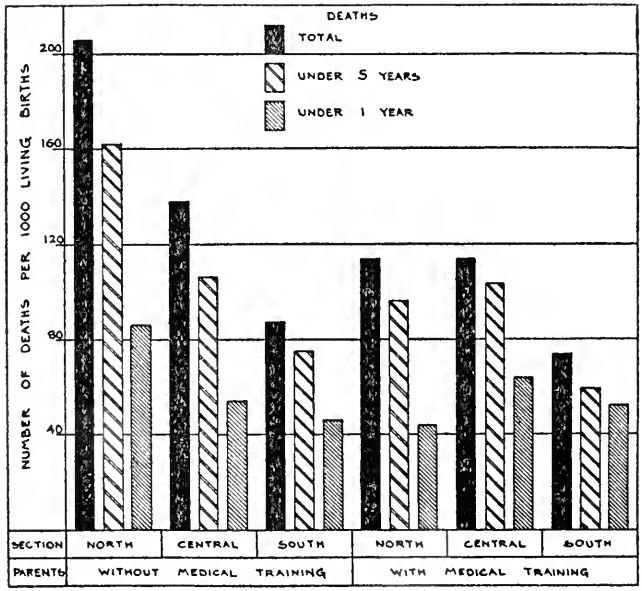


Figure 17. Mortality of children by medical training of parents and by sections of China. (Illustrating Table 34.)

This good showing of the trained does not mean that the doctors and nurses are concentrated in South China. Twenty-six per cent of their children are in North China, against 30 per cent of the children of those without training.

Table 34 and Figure 17 show that for each section of China the children of the medically trained have a lower mortality. (One exception is the high *infant* mortality among the trained of Central China.) The matter of medical training is not, however, the only factor, for the trained in North China have a higher rate than the untrained in South China.

**Table 35** MORTALITY OF CHILDREN BY MEDICAL TRAINING OF PARENTS AND BY GROUPS OF SOCIETIES

| SOCIETIES | Total Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| PARENTS WITH MEDICAL TRAINING | | | | | | | |
| First Group | 273 | 21 | 20 | 10 | 76 | 73 | 36 |
| Second Group | 237 | 26 | 24 | 14 | 109 | 101 | 59 |
| Third Group | 267 | 34 | 27 | 19 | 127 | 101 | 71 |
| **Total with Training** | 777 | 81 | 71 | 43 | 104 | 91 | 56 |
| PARENTS WITHOUT MEDICAL TRAINING | | | | | | | |
| First Group | 777 | 80 | 63 | 36 | 115 | 81 | 46 |
| Second Group | 678 | 92 | 74 | 33 | 135 | 109 | 48 |
| Third Group | 1,008 | 199 | 158 | 84 | 197 | 156 | 83 |
| **Total without Training** | 2,463 | 371 | 295 | 153 | 150 | 119 | 61 |

The good showing of the medically trained is in spite of the fact that doctors more than missionaries in other types of work have been used in pioneer work, located in inland stations where mortality rates would naturally be high. The same is not necessarily true of wives who are doctors or nurses (this may be one reason for the lower rates of these families in contrast with the families in which the husband is a doctor), but medically trained wives are usually called on for heavy work outside the home.

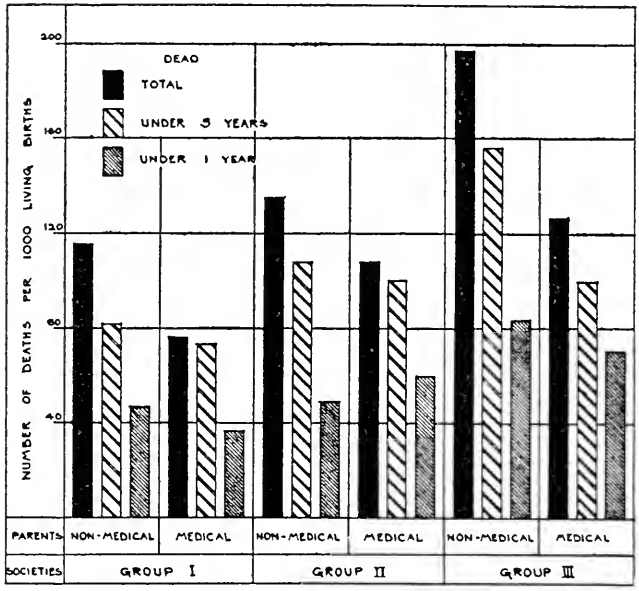


Figure 18. Mortality of children by medical training of parents and by groups of societies. (Illustrating Table 35.)

In Table 35 and Figure 18 the figures are reclassified into groups of societies. Here the same result is obtained. The trained in each group make a better showing than the untrained (except for the infants of the middle group), but the untrained of the first group have a lower rate than the trained of the third group. (For the societies comprising each group, see Table 26.)

### RATIO OF DOCTORS TO THE MISSION FORCE

A corollary of the preceding discussion is the question of the ratio of doctors to the missionary force. Table 36 gives the percentage of doctors among the 25 largest societies. The figures do not include children. The issue is not clear-cut, for certain societies, *e.g.*, the Y. M. C. A., are in cities where community or doctors of other missions are available. In the table the order of societies follows the order of total mortality of children, those with the lowest at the top. Five of the seven lower societies (71%) have less than the average percentage of doctors, while only three of the nine upper societies (33%) have less than the average percentage (6.1%).

The ratio given in the table for some of the English and Canadian societies is abnormally low because of the enlistment of some of their doctors in the war.

It would be of interest to know what percentage of stations are without doctors, also how many foreigners each mission doctor has dependent on him.

**Table 36** PERCENTAGE OF PHYSICIANS TO THE TOTAL ADULT MISSIONARY FORCE BY SOCIETIES

| SOCIETIES* | Total Foreign Force (Adult) | Number Physicians (Men and Women) | Percentage of Physicians |
|---|---|---|---|
| American Baptist, North | 136 | 14 | 10.3 |
| American Church Missions | 204 | 12 | 5.8 |
| American Methodist, North | 363 | 22 | 6.1 |
| London Mission | 149 | 16 | 10.7 |
| Y. M. C. A. | 175 | ------ | -------- |
| Other American Societies | 467 | 13 | 2.8 |
| Canadian Methodist | 178 | 13 | 7.3 |
| Church Missionary Society | 316 | 20 | 6.6 |
| American Presbyterian, North | 467 | 49 | 10.5 |
| American Lutheran Societies | 77 | 3 | 4. |
| American Board of Missions | 166 | 8 | 4.8 |
| Other English Societies | 319 | 66 | 2.1 |
| China Inland | 940 | 13 | 1.3 |
| American Presbyterian, South | 142 | 16 | 11.2 |
| Other European Societies | 184 | 5 | 2.7 |
| American Baptist, South | 153 | 11 | 7.1 |
| **Total** | 4,436 | 273 | 6.1 |

*Figures are taken from the China Mission Year Book (1918) and include only the 25 largest societies.

## RECENT AND REMOTE PERIODS

We look to the future. We are not particularly concerned about death rates of several decades ago. It is pertinent to inquire, therefore, (1) what proportion of the children of this study belong to recent times; (2) whether death rates of children have been decreasing at equal pace with the decrease in rates in England and America.

In order to answer these questions, all blanks were tabulated with respect to the number of years parents have been married.

Only a few reports were received concerning families not now on the field, so that practically all the subjects of this

study are the children of missionaries who are now active missionaries. Of the 3,126 children, whose parents' years of marriage are recorded, the parents of 31% were married less than 10 years ago, 70% less than 20 years ago, and 92% less than 30 years ago. Of the 2,623 *living* children, whose ages are recorded, only 51% are more than 9 years old, 15% more than 19 years, and 3% more than 29 years (Table 16). The average age of all children is 8.6 years. This study, then, deals in the main with a recent period of missionary work.

Table 37 gives the mortality for four periods. A source of error should be noted. Classification is based on the number of years married, rather than on the number of years *ago* married. In the cases in which a parent had died, the children are counted as born more recently than they were born. This error would tend to increase rates slightly for the more recent periods. In Table 38 only the 0-1 and 0-5 year groups are of value. Deaths after five years of age are naturally increased in the older families because the children are older.

**Table 37** MORTALITY OF CHILDREN BY LENGTH OF TIME PARENTS HAVE BEEN MARRIED

| Number of Years Which Parents Have Been Married | Total Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0-5 Years | 0-1 Year | Total | 0-5 Years | 0-1 Year |
| 0-9 | 986 | 92 | 90 | 48 | 93 | 91 | 49 |
| 10-19 | 1,219 | 151 | 129 | 76 | 123 | 106 | 62 |
| 20-29 | 672 | 132 | 100 | 47 | 182 | 149 | 70 |
| 30 and over | 249 | 58 | 34 | 14 | 233 | 136 | 56 |
| Years not stated | 89 | 8 | 7 | 6 | 90 | 79 | 67 |

If we divide the children into two groups, the first group comprising those whose parents have been married less than 20 years, the second group those whose parents have been married more than 20 years, and if we count the deaths for the first group by adding the number of children at present living but who will die before completing the first or the fifth year, we get the following figures: Infant mortality, first group 58, second group 66. Mortality under 5 years, first group 120, second group 145. This means a reduction of mortality between the two groups (*i.e.*, in the 10-15 years which separates the two) of 12% in infant mortality and 18% in mortality under five years.

Because of the round-about method of arriving at the above figures, comparison with government statistics must be far from accurate.

Between the years 1900 and 1911 infant mortality in the United States[16] was reduced 22%, and mortality under five years 27%. In England,[17] during the 40-year period ending 1911-15, mortality was reduced as follows: for the first year of life, about 30%; for the second year, a little over 40%; for the third, fourth, and fifth years, about 50%.

**Table 38** MORTALITY AMONG FIRST AND SECOND BORN CHILDREN BY NUMBER OF YEARS PARENTS HAVE BEEN MARRIED

| Number of Years Married | Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| 0–9 | 815 | 79 | 77 | 38 | 97 | 94 | 47 |
| 10–19 | 679 | 94 | 76 | 47 | 138 | 112 | 69 |
| 20–29 | 313 | 70 | 45 | 21 | 227 | 144 | 67 |
| 30 or more | 106 | 27 | 18 | 10 | 225 | 169 | 94 |

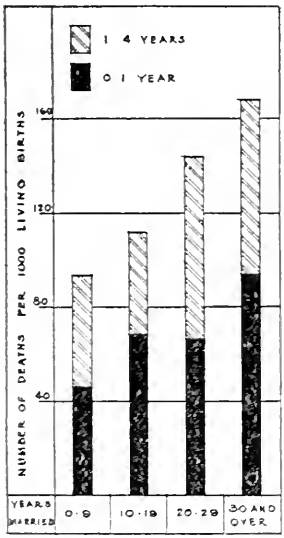


Figure 19. Mortality of first and second born children by number of years parents have been married. (Illustrating Table 38.)

In Table 38, as illustrated in Figure 19, only first and second births in each marriage period are counted. In this way the births are more sharply confined within the various periods. The difference in mortality for the 0-1 and 0-5 age periods of these first and second-born children is greater than when *all* children are counted. The difference is due largely to the very low mortality of third and later born children among those married more than 30 years. These 143 children show an infant mortality of only 21. Is this a case of survival of the fittest or of acquired immunity?

In Table 38 mortality of children of the first group (parents married less than 20 years) show, for infants, 25%, and for children under five, 32% improvement over the second group (parents married more than 20 years). These figures would be slightly less if corrected for the first and second born living children under five and one who will die before reaching those ages.

The study of this phase shows that there has been a reduction of child mortality among missionary children in recent years. It is doubtful, however, if this is greater than the reduction which has taken place among the general population of civilized countries during the same period. Probably the reduction would be greater if we had figures for children of the entire previous generation of missionaries. The families now on the field have demonstrated their ability to survive.

## ORDER OF BIRTH

**Table 39** MORTALITY OF CHILDREN BY ORDER OF BIRTH

| Order of Birth | Total Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| 1st born | 1,122 | 158 | 130 | 70 | 141 | 115 | 62 |
| 2nd " | 854 | 117 | 90 | 49 | 137 | 105 | 57 |
| 3rd " | 569 | 72 | 62 | 30 | 127 | 108 | 52 |
| 4th " | 340 | 42 | 33 | 20 | 124 | 94 | 58 |
| 5th " | 178 | 22 | 19 | 10 | 123 | 100 | 56 |
| 6th and more | 152 | 30 | 27 | 12 | 197 | 177 | 79 |
| Total | 3,215 | 441 | 360 | 191 | 137 | 112 | 59 |

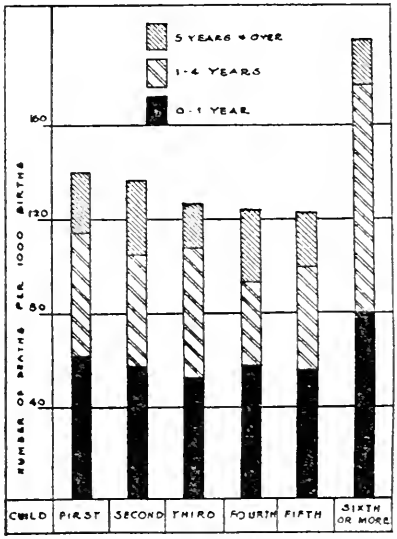


Figure 20. Mortality of children by order of birth. (Illustrating Table 39.)

In Table 39 and Figure 20 is shown the mortality of children by the order of birth. There is a slight downward tendency of all age groups until after the fifth child, when all rates leap upward. This rise is due entirely to increase in deaths among children under 5 years. The cause for this, in part at least, is shown in Figure 28, second column.

## NUMBER OF CHILDREN IN FAMILY

**Table 40** MORTALITY OF CHILDREN BY NUMBER OF CHILDREN IN FAMILY

| Number of Children in Family | Total Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0–5 Years | 0–1 Year | Total | 0–5 Years | 0–1 Year |
| 1 | 264 | 20 | 19 | 16 | 75 | 70 | 60 |
| 2 | 380 | 50 | 40 | 19 | 132 | 105 | 50 |
| 3 | 689 | 96 | 80 | 41 | 139 | 116 | 60 |
| 4 | 625 | 99 | 81 | 42 | 158 | 130 | 67 |
| 5 | 490 | 66 | 48 | 27 | 135 | 98 | 55 |
| 6 | 252 | 51 | 45 | 23 | 202 | 179 | 93 |
| 7 | 74 | 21 | 16 | 10 | 284 | 216 | 135 |
| 8 | 72 | 11 | 8 | 4 | 153 | 111 | 56 |
| 9 | 63 | 18 | 15 | 6 | 286 | 238 | 95 |
| 10, 11, 12 | 62 | 18 | 14 | 6 | 290 | 226 | 97 |
| Total | 3,229 | 450 | 66 | 194 | 139 | 113 | 60 |

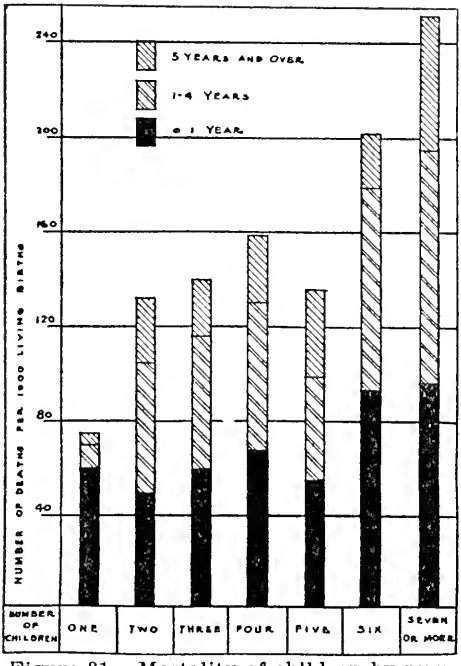


Figure 21. Mortality of children by number of children in the family. (Illustrating Table 40.)

Table 40 and Figure 21 show mortality according to the size of the family. Infant mortality remains fairly constant until families having more than five children are reached. Mortality of other children, however, increases progressively, as the family increases in size. A curious fact is the relatively low mortality in families where there are five children.

The increase of rate for large families is due in part to the fact that the children are older.

## BIRTHPLACE OF CHILDREN

Table 41 MORTALITY OF CHILDREN BY BIRTHPLACE

| BIRTHPLACE | Number of Living Births | Number of Deaths | | | Number of Deaths Per 1,000 Living Births | | |
|---|---|---|---|---|---|---|---|
| | | Total | 0-5 Years | 0-1 Year | Total | 0-5 Years | 0-1 Year |
| Outside of China | 385 | 49 | 40 | 20 | 128 | 104 | 52 |
| In China | 2,819* | 399 | 325 | 174 | 141 | 115 | 62 |

*Includes a few children whose place of birth was not stated.

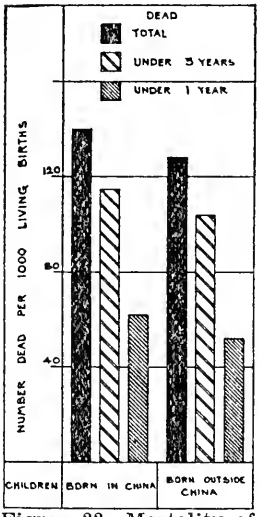


Figure 22. Mortality of children by birthplace. (Illustrating Table 41.)

Among missionaries one often hears discussions concerning the relative health of children born in China and those born at home. Table 41 shows that there is no great difference of mortality in the two groups. The advantage for those born outside China is 14% for the first year and 10% for the rest of life. Children born outside China have spent 58% of their life in China, while all children have spent 67%.

The following is the list of birthplaces of children born outside of China: United States, 191; England and Wales, 53; Canada, 28; Scotland, 15; Sweden, 12; Australia and New Zealand, 11; Germany, 10; Norway and Finland, 6; Ireland, 3; miscellaneous, 56; total, 385. Percentage of children born in China, 87.5; percentage of married life spent in China, 81.0.

## OTHER FACTORS OF CHILD MORTALITY

It was realized that the more questions asked in the questionnaire, the fewer would be the answers. Therefore, several important factors not included in the statistical study should be mentioned.

*Salaries*—As a rule, curves of child mortality closely parallel the curves representing family income, *i.e.*, the lower the wages, the higher the number of deaths. It is likely that where missionary salaries are insufficient to provide summer vacations, the best milk available, medical overhauling on furlough, etc., deaths will result. Though exact information has not been obtained, the writer thinks that the average salary paid by societies in the lower half of Table 26 is less than that

paid by societies in the upper half. One parent in the former group writes, "How can I bring up and educate my children on a salary of (the equivalent of) G $400 a year?" However, such a cry was found in the letters but rarely. Information as to whether there is waste of life and efficiency because of sub-living salaries would be hard to secure from the missionaries directly.

*Amahs.* "The environment of the infant," says Sir George Newman,[18] "is its mother." "The problem of infant mortality is not one of sanitation alone, of housing, or indeed of poverty as such, but is mainly a question of motherhood."[19] Another says, "The most important factors in infant mortality are the strength, the health, the character and the intelligence of the mother."[20] An extremely pertinent question is, "What is the effect on child mortality in China of the substitution of hired nursehood for motherhood, of the substitution of the 'health, the character and the intelligence' of a Chinese servant woman for the 'health, the character and the intelligence' of the missionary mother? If children are delivered entirely into the keeping of servant Chinese, we cannot expect a mortality a great deal lower than that for the Chinese children, as shown in Figure 1.

There is naturally a wide difference of opinion as to how much the personal care of children should be subordinated to the prosecution of mission work. One mother takes her small children with her on country trips purely as a bait for attracting crowds. Though these statistics do not permit analysis of the part care and feeding of the children by amahs plays in child mortality, a number of the correspondents deal with the point and make it clear that they consider it an important factor in mortality of missionary children in China.

*Kitchens*—A third of all deaths of these children were due to intestinal infections; dysentery, diarrhœa, cholera, and typhoid fever. This points to the enormous importance of the kitchen in the life, or death, of missionary children. Many kitchens in North China are dark, dirty, and fly-infested, used by all the servants, the government an absolute monarchy with the native cook on the throne; in short, a favorable port of embarkation for all germs bound intestineward.

The importance of breast-feeding and medical care have been mentioned. Other factors which can be only named are: milk and water supply, location in the city or country, method of sewage disposal, summer vacations, location of schools, etc.

## THE CAUSE OF DEATH, BY GROUPS OF DISEASES

Besides knowing the proportion of children dying, it is important from the side of prevention that we know the causes of death. For purposes of comparison, all causes of deaths are divided into ten groups. By this means we diminish the error from using small numbers and from inexact diagnoses.

The groups used are as follows: (1) dysentery ("with blood and mucus" specified on question blank), both acute and chronic. (2) Intestinal infections aside from dysentery and typhoid fever, including diarrhœa, colitis, cholera infantum, Asiatic cholera, enteritis. (3) Respiratory infections—bronchitis, pneumonia, and whooping cough. (4) Smallpox. (5) Six major infections, viz., diphtheria, scarlet fever, typhoid fever, tuberculosis, malaria and meningitis. (6) Birth defect and injury, difficult labor, eclampsia, malformation, etc. (7) Prematurity. (8) Malnutrition, difficult feeding. (9) All other causes, and (10) cause unknown, not stated or unintelligibly stated.

### GEOGRAPHICAL LOCATION

**Table 42** MORTALITY FROM VARIOUS DISEASES BY SECTIONS OF CHINA

| SECTION OF CHINA | Total Number Living Births | Number of Deaths Per 1,000 Living Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Other Major Infections | Birth Defect or Injury | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| North | 958 | 32 | 19 | 22 | 9 | 38 | 8 | 7 | 5 | 29 | 11 |
| Central | 1,740 | 21 | 17 | 14 | 6 | 25 | 7 | 5 | 4 | 19 | 10 |
| South | 506 | 9 | 1 | 1 | ------ | 19 | 5 | 3 | 7 | 16 | 7 |

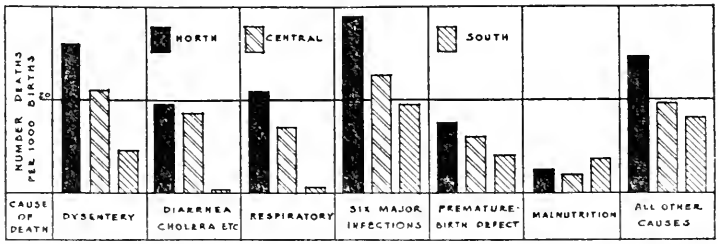


Figure 23. Mortality of children from various causes by sections of China. (Illustrating Table 42.)

Tables 42-49 give the number of deaths for all ages per 1,000 children born. Table 42 and Figure 23 show why death rates decrease from North China to South China. Every disease group with the single exception of "malnutrition"

shows this downward curve. The sharpness of the descent is most marked for the intestinal, respiratory and smallpox groups, and less marked for the major infectious group.

The figures show strikingly the disproportionate importance of infections over constitutional causes of death in North China. If we add the first five groups embracing the infectious (bacterial) diseases, and take the ratio for North China as the index, Central China shows 39% and South China only 14% of the deaths which North China records. Now if we combine the next three groups—which gives the deaths for nutritional, developmental and birth causes—we find that Central China has 80% and South China 75% of the rate for North China.

In other words, as a cause of death these non-infectious conditions are, in relation to North China as a standard, two times more important in Central China and five times more important in South China than the infectious diseases.

### MISSIONARY SOCIETIES

Some of the *external* factors which influence mortality rates in societies (*i. e.*, age of children, number in family, percentage of time in China, geographical distribution of workers, proportion of doctors) have been considered. Other even more important factors are *internal* to the societies, having to do with the policy of the boards towards the selection of workers and subsequent care of them. There is no attempt in this paper to relate mortality rates of individual societies to these internal factors. This can be done best by members of the various societies.

It is important, however, that this study help show societies from what quarters death has come in the past. This is attempted in Table 43. Division of the statistics into so many groups diminishes the reliability of results, so that only marked differences from the average should attract attention.

**Table 43** MORTALITY OF CHILDREN FROM VARIOUS CAUSES, BY SOCIETIES

| SOCIETY | Total Number of Living Births | Number of Deaths Per 1,000 Living Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defect or Injury | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| Am. Bapt., North | 99 | 10 | 10 | 20 | ------ | 20 | 10 | ------ | ------ | ------ | ------ |
| Am. Church Mis. | 78 | 26 | 13 | ------ | ------ | 13 | ------ | ------ | ------ | 13 | 13 |
| Am. Meth., North | 197 | 20 | 5 | 15 | 5 | 10 | ------ | 10 | ------ | 15 | ------ |
| London Mission | 82 | ------ | 12 | ------ | ------ | 12 | ------ | ------ | ------ | 60 | ------ |
| Y. M. C. A. | 120 | 17 | 17 | 8 | ------ | 8 | 8 | 17 | 25 | ------ | ------ |
| Other Am. Soc. | 437 | 16 | 9 | 18 | 7 | 25 | 2 | 7 | 2 | 16 | 9 |
| Total—1st group | 1,013 | 16 | 10 | 14 | 4 | 18 | 3 | 7 | 4 | 16 | 5 |
| Canadian Meth. | 134 | 30 | 7 | 15 | ------ | 7 | 7 | 7 | 7 | 15 | 15 |
| Church Mis. Soc. | 94 | ------ | 11 | 21 | ------ | 32 | 11 | ------ | ------ | 32 | 11 |
| Am. Presb., North | 314 | 22 | 6 | 9 | 6 | 18 | 6 | 9 | 6 | 26 | 6 |
| Am. Luth. Soc. | 137 | 21 | 7 | 7 | 21 | 14 | ------ | ------ | ------ | 14 | 42 |
| Am. Board Mis. | 138 | 43 | 7 | 7 | ------ | 36 | ------ | ------ | 7 | 36 | 7 |
| Eng. Baptist | 98 | 20 | 20 | 20 | ------ | 20 | 20 | 20 | ------ | 20 | 20 |
| Total—2nd group | 915 | 24 | 8 | 12 | 5 | 20 | 6 | 6 | 4 | 24 | 15 |
| Other Eng. Soc. | 291 | 34 | 7 | 10 | 7 | 31 | 7 | 7 | ------ | 34 | ------ |
| China Inland Mis. | 449 | 22 | 9 | 22 | 4 | 40 | 4 | 4 | 7 | 29 | 22 |
| Am. Presb., South | 106 | ------ | 56 | 19 | ------ | 56 | 28 | 9 | ------ | 9 | 9 |
| Other European Soc. | 171 | 40 | 18 | 29 | 18 | 23 | ------ | 6 | 6 | 40 | 12 |
| Am. Baptist, South | 119 | 25 | 33 | 8 | ------ | 75 | 17 | ------ | 17 | 42 | 17 |
| European C. I. M. | 139 | 43 | 72 | 14 | 22 | 43 | ------ | ------ | ------ | 29 | 7 |
| Total—3rd group | 1,275 | 28 | 26 | 18 | 6 | 40 | 5 | 4 | 4 | 31 | 12 |
| **All Societies** | 3,203 | 23 | 15 | 15 | 6 | 28 | 5 | 6 | 4 | 24 | 11 |

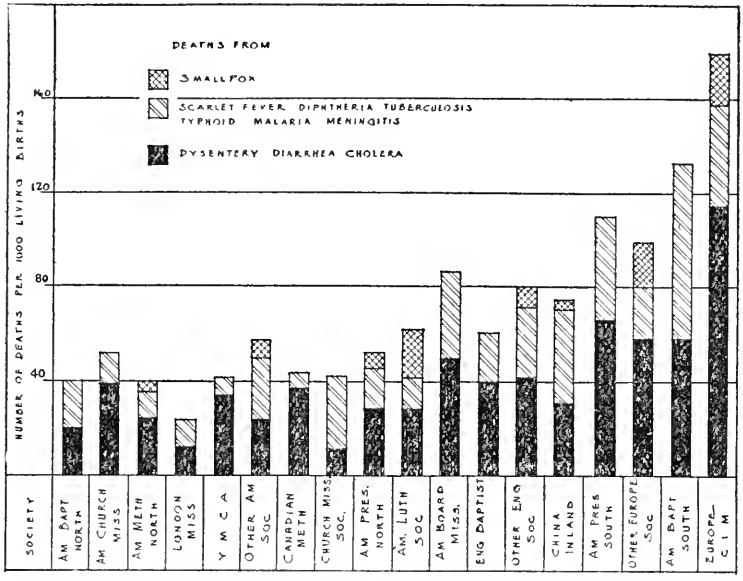


Figure 24. Mortality of children from various causes by societies. The societies are in the order of total mortality, as in Figures 11 and 12. (Illustrating Table 43.)

Table 43 gives the deaths from various causes by societies. Figure 24 shows the relative number of deaths from four of the groups of diseases. Here, as in Table 42, the striking difference is between the infectious and constitutional causes. Societies which are near the bottom of the list are there because of the six major and the intestinal infectious diseases. There is little difference between the first and third groups of societies in respiratory infections, and practically no difference in the deaths connected with birth and nutrition. Three of the society groups show relatively twice as many deaths from smallpox as all other societies combined.

## NATIONALITY OF SOCIETIES

**Table 44** MORTALITY OF CHILDREN FROM VARIOUS CAUSES BY NATIONALITY OF MISSIONARY SOCIETIES

| SOCIETIES WITH HEAD OFFICES IN | Total Number of Living Births | Number of Deaths Per 1,000 Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defect or Injury | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| America | 1,662 | 21 | 14 | 13 | 5 | 27 | 6 | 5 | 5 | 19 | 1 |
| Great Britain and Canada | 776 | 21 | 9 | 11 | 2 | 20 | 8 | 1 | 1 | 28 | 6 |
| (China Inland) | 449 | 22 | 9 | 22 | 4 | 40 | 4 | 4 | 7 | 29 | 22 |
| Europe | 310 | 42 | 42 | 22 | 19 | 32 | ------ | 3 | 3 | 35 | 10 |

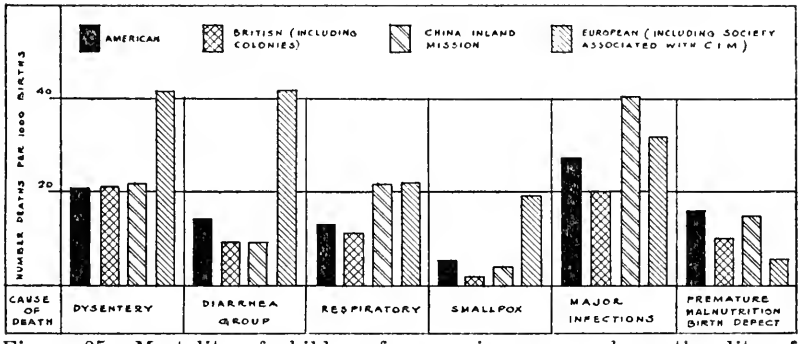


Figure 25. Mortality of children from various causes by nationality of missionary societies. (Illustrating part of Table 44.)

Table 44 and Figure 25 show the causes of deaths by nationality of societies. American and English (including colonial) societies show no significant differences in causes of death. The China Inland group (which is mostly English and American) shows an increase in respiratory and major infections. The European societies (which include those associated with the C. I. M.) show greatest increase in the intestinal infections, in smallpox, and in miscellaneous causes.

## BIRTHPLACE OF PARENTS

**Table 45** MORTALITY OF CHILDREN FROM VARIOUS CAUSES BY BIRTHPLACE OF PARENTS

| BIRTHPLACE OF PARENTS | Total Number of Living Births | Number of Deaths Per 1,000 Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defect or Injury | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| One or both born in China | 176 | 28 | 5 | 11 | ------ | 39 | 11 | 5 | ------ | 17 | ------ |
| Both born in Europe | 218 | 50 | 22 | 36 | 32 | 36 | 4 | 4 | ------ | 36 | 18 |
| All others where both stated | 1,503 | 18 | 18 | 15 | 5 | 28 | 8 | 6 | 4 | 15 | 6 |
| Total all societies | 3,203 | 23 | 15 | 15 | 6 | 28 | 5 | 6 | 4 | 24 | 11 |

Table 45 is deficient because for more than one-half of the children the birthplace of parents was not recorded. Unfortunately for the accuracy of the computation, the number of children with a parent born in China is small. These children have no deaths from smallpox or malnutrition, and relatively few from diarrhœa.

Of all the children whose parents were born in Europe 5% have died of dysentery and more than 3% of smallpox. Of the children who have died, 15% have died of smallpox.

## MEDICAL TRAINING OF PARENTS

**Table 46** MORTALITY OF CHILDREN FROM VARIOUS CAUSES BY MEDICAL TRAINING OF PARENTS

| MEDICAL TRAINING OF PARENTS | Total Number of Living Births | Number Deaths Per 1,000 Living Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defects and Injuries | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| Father a doctor | 379 | 24 | 19 | 19 | ------ | 21 | 10 | ------ | ------ | 21 | 10 |
| Mother a doctor or nurse | 252 | 16 | 12 | 12 | ------ | 8 | 16 | ------ | 8 | 12 | 12 |
| Both parents trained | 146 | 27 | 7 | ------ | ------ | 7 | 7 | 7 | 7 | 20 | ------ |
| **Total** | 777 | 22 | 14 | 13 | ------ | 14 | 11 | 1 | 4 | 18 | 8 |
| Neither parent medically trained | 2,463 | 23 | 16 | 16 | 8 | 32 | 7 | 7 | 5 | 23 | 11 |

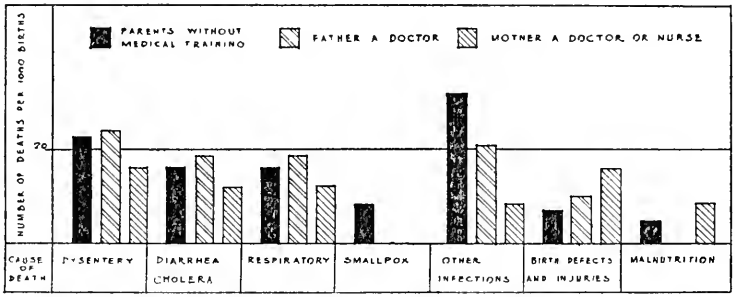


Figure 26. Mortality of children from various causes by medical training of parents. (Illustrating part of Table 46.)

We turn with interest to the cause of death among the medically trained, shown in Table 46 and Figure 26. As between father and mother who are trained, we are prepared to find as we do, that intestinal infections are less in the families in which the trained mother has charge of the kitchen. Even more marked, however, is the reduction in deaths from major infections. Presumably this is not because the doctor-wife or nurse-wife is better in curing disease, but because she is more successful in preventing infection.

Comparing the last two lines of the table we see that the children of the medically trained have suffered less than the untrained from the major (mostly air-borne) infections and less from pre-maturity (presumably because of better pre-natal care). No children of this class have died of smallpox.

It is disappointing to find that children of the trained die from intestinal infections almost as frequently as children of the untrained.

## RECENT AND REMOTE PERIODS

**Table 47** MORTALITY OF CHILDREN FROM VARIOUS CAUSES BY NUMBER OF YEARS PARENTS HAVE BEEN MARRIED

| NUMBER OF YEARS PARENTS HAVE BEEN MARRIED | Total Number of Living Births | Number of Deaths Per 1,000 Living Births From specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defects and Injuries | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| 0–9 | 986 | 21 | 8 | 8 | 3 | 14 | 9 | 8 | 5 | 10 | 5 |
| 10–19 | 1,209 | 21 | 16 | 16 | 7 | 23 | 9 | 5 | 5 | 16 | 11 |
| 20–29 | 672 | 27 | 25 | 27 | 12 | 50 | 6 | 6 | 1 | 36 | 9 |
| 30 plus | 249 | 32 | 28 | 16 | 4 | 44 | ------ | ------ | 28 | 60 | 32 |

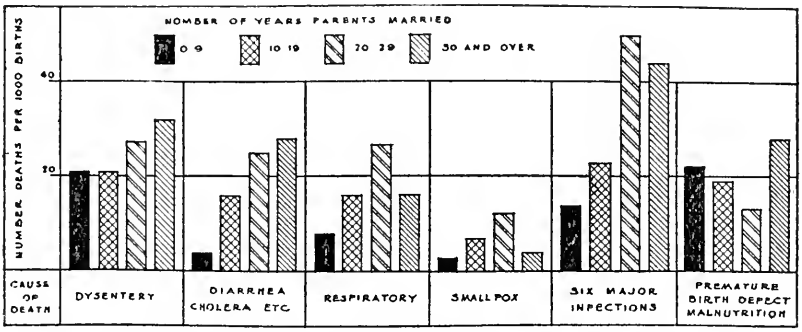


Figure 27. Mortality of children from various causes by number of years parents have been married. (Illustrating part of Table 47.)

In Table 47, all groups, except those associated with birth, show diminished deaths for families married the shortest length of time. As this is for deaths at all ages, naturally the younger families have had fewer deaths. The percentage reduction from the highest to lowest rate is 60%. Dysentery has shown less than the average reduction (34%). Deaths connected with birth have increased in the younger families rather than diminished. All other groups show a large reduction in the younger families of from 70% to 87%.

## ORDER OF BIRTH

**Table 48** MORTALITY OF CHILDREN FROM VARIOUS CAUSES BY ORDER OF BIRTH

| ORDER OF BIRTH | Total No. Living Births | Number of Deaths Per 1,000 Living Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defects and Injuries | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| 1st born | 1,122 | 25 | 12 | 14 | 2 | 27 | 10 | 10 | 4 | 20 | 11 |
| 2nd born | 854 | 25 | 21 | 13 | 5 | 38 | 3 | 4 | 3 | 25 | 8 |
| 3rd born | 569 | 33 | 19 | 12 | 9 | 21 | 9 | 2 | 3 | 14 | 10 |
| 4th and 5th born | 518 | 15 | 6 | 23 | 6 | 29 | 8 | 2 | 8 | 25 | 10 |
| Born 6th or later | 151 | 20 | 33 | 26 | 33 | 20 | 7 | 7 | 7 | 59 | 13 |

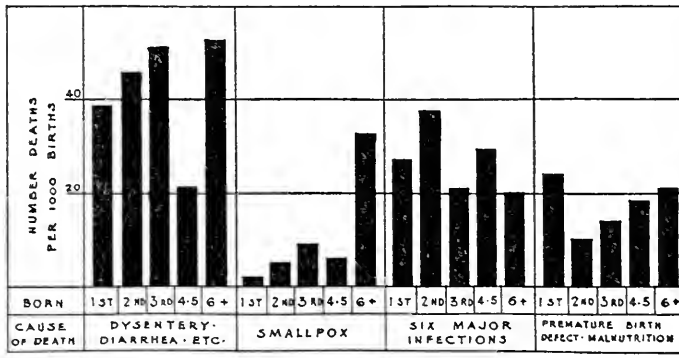


Figure 28. Mortality of children from various causes by order of birth. (Illustrating part of Table 48.)

Table 39 showed a gradual reduction in deaths among children through the fifth born. In looking for the cause of this reduction, in Table 48 we find that the premature group is the only one showing a steady decline, but that the diarrhœa and major infections group show fewer deaths among the third to fifth born than among the first and second born. Parents learn somewhat with experience how to guard against these infections.

What is the cause of the sudden rise in rates for the sixth or later born children? There are only 151 of this group. The rise is almost entirely due to four groups, viz., miscellaneous causes, smallpox, diarrhœa, and respiratory infections. Smallpox causes six times the number of deaths in these later born children that it causes in the first to fifth born. Can it be that parents with six or more children find the task of providing protective vaccination for the last born children too burdensome?

Dysentery and major infections, be it noted, diminish in power over the last born. Is this because of better preventive measures learned through experience, or because of acquired resistance?

## NUMBER OF CHILDREN IN FAMILY

**Table 49** MORTALITY OF CHILDREN FROM VARIOUS CAUSES BY NUMBER OF CHILDREN IN FAMILY

| NUMBER OF CHILDREN IN FAMILY | Total Number of Living Births | Number of Deaths Per 1,000 Living Births From Specified Causes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dysentery | Diarrhea-Cholera | Respiratory | Smallpox | Six Major Infections | Birth Defects and Injuries | Premature | Malnutrition | All Other Causes | Cause Not Stated |
| 1 | 264 | 11 | 4 | ..... | ..... | 4 | 4 | 19 | ..... | 11 | 24 |
| 2 | 380 | 18 | 8 | 26 | 8 | 18 | 16 | 3 | 5 | 16 | 5 |
| 3 | 689 | 27 | 16 | 14 | 1 | 36 | 6 | 7 | 4 | 22 | 7 |
| 4 | 625 | 24 | 19 | 14 | 6 | 35 | 10 | 6 | 13 | 22 | 6 |
| 5 | 490 | 20 | 16 | 16 | 2 | 24 | 6 | ..... | 2 | 35 | 14 |
| 6 or more | 523 | 38 | 29 | 23 | 21 | 48 | 8 | 6 | 6 | 29 | 19 |

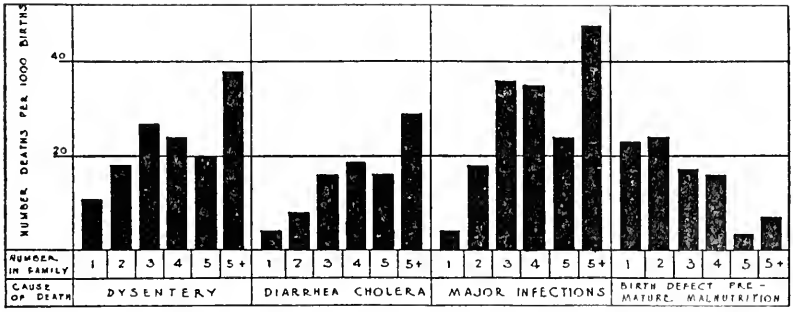


Figure 29. Mortality of children from various causes by number of children in families. (Illustrating part of Table 49.)

Table 40 showed a three-fold increase in total deaths for the families with six or more children over the families with one child. In Table 49 and Figure 29 we see that this increase is due to the principal infectious diseases. Deaths from dysentery increased 3.6 times, diarrhœa 7 times, major infections 12 times, and smallpox (average of first five groups) nearly 7 times. On the other hand, deaths from respiratory infections, birth, malnutrition, etc., have not increased with the increasing size of the family.

This means that quarantine within the family, especially for the air-borne infections, has been at fault. Deaths from dysentery and diarrhœa have been twice the average increase, but deaths from the group of diphtheria, scarlet fever, malaria, tuberculosis, meningitis and typhoid have been four times the average. This is in spite of the fact that deaths from these infections among later born children are less than among earlier born. Study of individual reports shows infec-

tions, once started, run through families as they would not in communities where isolation and quarantine are strictly enforced.

## CAUSES OF DEATH BY INDIVIDUAL DISEASES

Table 50 gives the number dying from these various diseases, and the ages at death. Figure 30 shows the percentage of the total deaths, in which a cause was given, due to the various diseases or groups of diseases. Dysentery alone has caused nearly a fifth of the deaths. Dysentery together with the acute intestinal infections (diarrhœa, enteritis, cholera, etc.) have caused nearly a third of the total.

Sixty-nine per cent of the deaths from dysentery and 81% of those from diarrhœa occurred during the first two years of life.

**Table 50** CAUSES OF DEATHS OF CHILDREN WITH AGE AT TIME OF DEATH

| DISEASE | Total All Ages | Number of Deaths at Ages Specified | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MONTHS | | | | YEARS | | | | | | | | |
| | | 0–1 | 1–2 | 3–5 | 6–11 | 0–1 | 1 | 2 | 3 | 4 | 5 | –10 | –20 | N.S.* |
| Dysentery | 77 | 1 | ---- | ( | 19 | 26 | 27 | 11 | 6 | 3 | 4 | ---- | ---- | ---- |
| Diarrhea, Cholera, etc. | 47 | 1 | 3 | 6 | 11 | 21 | 17 | 4 | 1 | ---- | 1 | 2 | ---- | 1 |
| Respiratory | 51 | 2 | 2 | 5 | 12 | 21 | 14 | 10 | 2 | ---- | 3 | 1 | ---- | ---- |
| Diphtheria | 24 | ---- | ---- | 2 | ---- | 2 | 7 | 6 | ---- | 3 | 6 | ---- | ---- | ---- |
| Smallpox | 19 | 2 | 1 | 4 | 3 | 10 | ---- | 3 | ---- | 4 | 2 | ---- | ---- | ---- |
| Meningitis | 17 | ---- | ---- | 2 | 3 | 5 | 4 | 2 | 1 | ---- | 2 | 1 | 2 | ---- |
| Scarlet Fever | 16 | ---- | ---- | ---- | ---- | ---- | 1 | 1 | 1 | 4 | 9 | ---- | ---- | ---- |
| Typhoid Fever | 12 | ---- | ---- | ---- | 1 | 1 | 3 | 1 | 1 | 1 | 3 | ---- | 2 | ---- |
| Malaria | 10 | ---- | ---- | ---- | 2 | 2 | 1 | 3 | 2 | ---- | 2 | ---- | ---- | ---- |
| Tuberculosis | 10 | ---- | ---- | ---- | 2 | 2 | 2 | 1 | ---- | ---- | 1 | 2 | 2 | ---- |
| Other Infections | 20 | 2 | ---- | 2 | 3 | 7 | 3 | 3 | ---- | 1 | 4 | 2 | ---- | ---- |
| Premature | 19 | 18 | ---- | 1 | ---- | 19 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Injury at Birth | 10 | 9 | 1 | ---- | ---- | 10 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Birth Defect | 12 | 6 | ---- | 1 | 3 | 10 | 1 | 1 | ---- | ---- | ---- | ---- | ---- | ---- |
| Malnutrition | 14 | 2 | 1 | 4 | 4 | 11 | 2 | 1 | ---- | ---- | ---- | ---- | ---- | ---- |
| Convulsions | 5 | 3 | 1 | 1 | ---- | 5 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Miscellaneous | 17 | 1 | ---- | 3 | 4 | 8 | ---- | ---- | 2 | ---- | 3 | 3 | 1 | ---- |
| Accident | 9 | ---- | ---- | 1 | ---- | 1 | 2 | ---- | 1 | 1 | ---- | 2 | 2 | ---- |
| War | 11 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 4 | 6 | 1 |
| Cause Not Stated | 44 | 20 | 2 | 3 | 8 | 33 | 3 | 1 | ---- | 2 | 1 | 2 | 2 | ---- |
| Total | 444 | 67 | 11 | 41 | 75 | 194 | 87 | 48 | 17 | 19 | 41 | 19 | 17 | 2 |

*Age not stated.

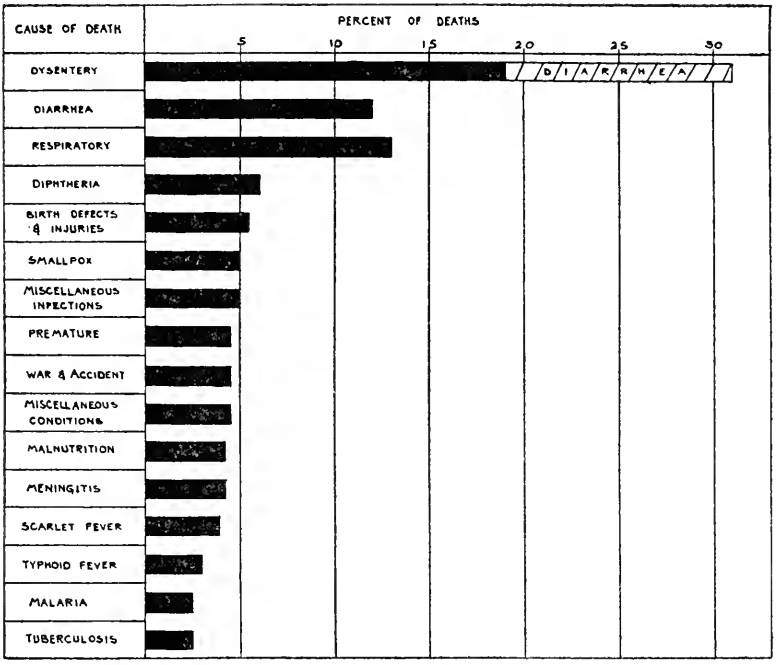


Figure 30. Percentage of deaths of children from various causes. (Derived from Table 50.)

In the table "diarrhœa" includes all cases of acute intestinal infection other than dysentery and typhoid fever. Seven cases were listed as cholera.

"Respiratory" includes, besides pneumonia, six cases of bronchitis and six of whooping cough. Of the children dying of whooping cough, five were aged one year or under, one was five years old.

"Diphtheria" includes three cases listed as tonsilitis.

"Other Infections" include fever three, appendicitis three, vaccination two, erysipelas two, measles two, and one each of liver abscess, typhus fever, sore throat, influenza, sprue, kalaazar, infantile paralysis, and blood poisoning.

"Miscellaneous" includes heart trouble three, nephritis two, hardship two, and one each of intersusception, spinal disease, diabetes, jaundice, circumcision, poisoning, sunstroke, sewage gas, myxedema, and seasickness.

"Accident" includes three killed by bandits, two by drowning, one suffocated by quinine pill.

"Premature" births were, in one case each, said to be due to eclampsia, dysentery, malaria, and quinine.

Three of the ten deaths from tuberculosis were due to tuberculous meningitis.

**Table 51** PERCENTAGE OF DEATHS OCCURRING AT SPECIFIED AGES, DUE TO VARIOUS CAUSES, COMPARED WITH UNITED STATES AND ENGLAND

| CAUSE OF DEATH | Missionary Children | | | United States 1918 (Native White Parents) | | | England and Wales 1917 | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0-1 Year | Under 5 Years | 5-9 Years | 0-1 Year | Under 5 Years | 5-9 Years | 0-1 Year | Under 5 Years | 5-9 Years |
| Typhoid Fever | .6 | 2.1 | 7.5 | .03 | .16 | 2.7 | .001 | .01 | .4 |
| Malaria | 1.3 | 2.5 | 5. | .09 | .15 | 2.7 | | | |
| Smallpox | 6.3 | 5.2 | 5. | .01 | .02 | .04 | | | |
| Measles | 1.2 | .8 | | 1.3 | 2.9 | 3.4 | 2.8 | 8.9 | 7.5 |
| Scarlet Fever | | 2.1 | 22.5 | .08 | .55 | 3.3 | .05 | .4 | 1.8 |
| Diphtheria and Croup | 1.3 | 5.6 | 10.5 | .5 | 3. | 13.7 | .2 | 2.2 | 13.8 |
| Dysentery | 16. | 23. | 10. | .4 | .6 | .5 | .01 | .01 | .03 |
| Tuberculosis | 1.3 | 1.5 | 2.5 | 1.5 | 2.7 | 7.4 | 2.9 | 6.1 | 22. |
| Syphilis | | | | 1.2 | .9 | .2 | 2.1 | 1.4 | .06 |
| Meningitis | 3.1 | 4. | 5. | .8 | 1.3 | 2.7 | 1.4 | 2. | 4.4 |
| Bronchitis, Pneumonia and Whooping Cough | 13.3 | 14. | 7.5 | 16.6 | 18.8 | 9.9 | 23.4 | 26.8 | 13.2 |
| Cholera, Diarrhea, Enteritis | 13.5 | 13.5 | 2.5 | 23.1 | 22.2 | | 10.7 | 8.9 | 2. |
| Premature Birth | 11.3 | 5.5 | | 20.4 | 14.4 | | 19.9 | 12.2 | |
| Injury at Birth | 6. | 2.4 | | 4.1 | 2.8 | | 1.2 | .7 | |
| **Total** | 75.2 | 82.4 | 78. | 70.1 | 70.5 | 46.5 | 64.6 | 69.6 | 65.1 |
| All other causes | 24.8 | 17.8 | 22. | 29.9 | 29.5 | 53.5 | 35.4 | 30.4 | 34.9 |

Table 51 compares the principal causes of death among missionary children, the white population of America,[9] and the general population of England and Wales.[21] The figures are the percentage of the total deaths for the ages specified.

It should be noted that diagnoses given by parents are oftentimes inaccurate, as their idea of the doctor's diagnosis may be in error, or there may have been no doctor in attendance. In government statistics, on the other hand, diagnoses are nearly always made by the physician in attendance. For this reason, no emphasis is laid on any but the well marked differences in Table 51. Again, the figures, being percentages of the total number of deaths for the various ages, would total 100 for each age group. Other diseases not named in the table (mainly those classed under "other fevers" and "miscellaneous") would show higher percentages for England and America than for missionaries. In the table, percentages for respiratory infections, prematurity, measles, tuberculosis, and syphilis are lower among missionary children than among children in England and America.

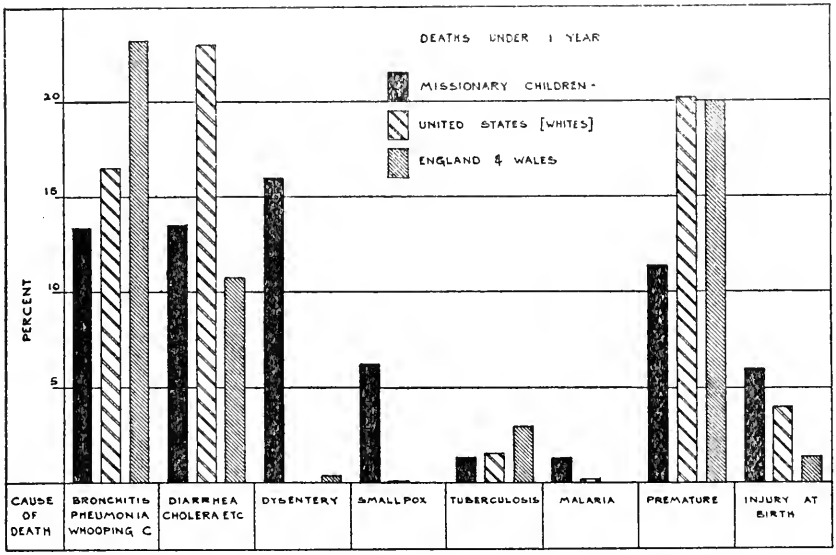


Figure 31. Percentage of deaths *under one year of age* from various causes among Missionary Children and children in the United States and England. (Illustrating part of Table 51.)

The most significant differences are shown in the three following charts. Figure 31 gives the deaths under one year. Three points stand out: (1) The high black tower representing deaths from dysentery, 40 times higher than the corresponding column for England and Wales, and 1,600 times that for the United States. (2) The black gravestone standing over smallpox—a monument to lives needlessly sacrificed. (3) A death rate from prematurity only one-half the standard (for which the absence of venereal disease may largely account), but a death rate from obstetrical disasters of twice the standard—probably the result of insufficient medical attention.

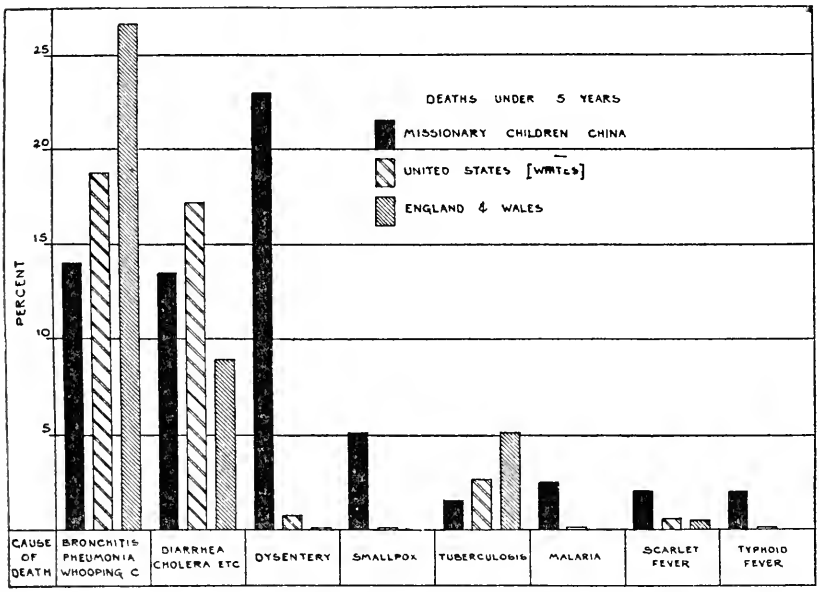


Figure 32. Percentage of deaths *under five years of age* from various causes among Missionary Children and children in the United States and England. (Illustrating part of Table 51.)

The deaths under five years from dysentery (Figure 32) show an even higher proportion of the total (23%). Smallpox shows a rate 260 times that for the United States and infinitely above England, as that country had no deaths at these ages from smallpox in 1917.

The comparative infrequency among missionary children of deaths from respiratory infections is striking for all three age groups. The relative immunity of adults to influenza during the pandemic of 1917 is noted elsewhere (p. 91).

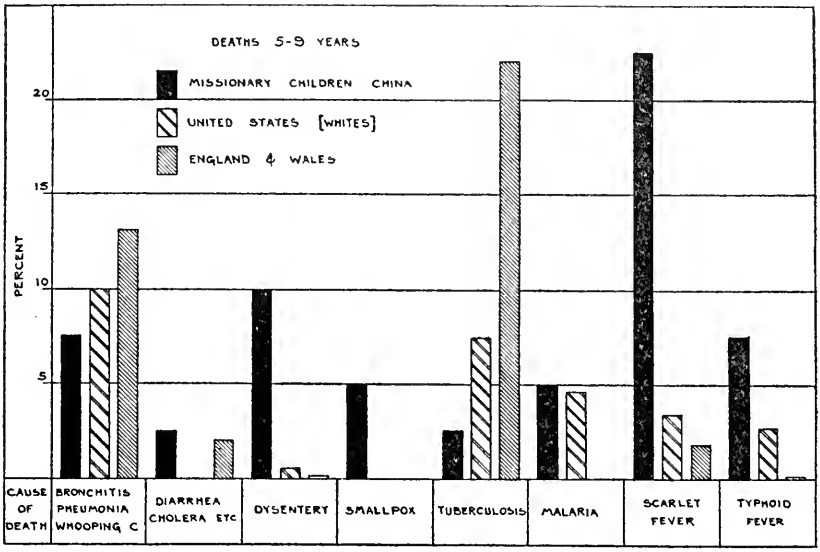


Figure 33. Percentage of deaths *five to nine years of age* from various causes among Missionary Children and children in the United States and England. (Illustrating part of Table 51.)

As there are only 40 deaths of children aged 5-9 recorded, Figure 33 has not as great value as the other charts. Besides the persistently prominent position of dysentery and smallpox, the figure shows the comparative deadliness of scarlet fever at this age. Typhoid fever is given as cause of death in 7.5% of the cases. This points the need of typhoid inoculation for children of this age.

## DEATHS OUTSIDE CHINA

**Table 52** CAUSES OF DEATHS OCCURRING OUTSIDE OF CHINA

| CAUSE OF DEATH | Number | Ages at Death | SOCIETIES |
|---|---|---|---|
| Infantile Paralysis | 1 | 3 days | Swed. All. Miss. |
| Dysentery | 2 | 1.2 | Swed. Miss. Soc., Danish Lutheran. |
| Diarrhea | 3 | 1 | Y. M. C. A., Baptist No., Pres. South. |
| Pneumonia | 1 | 2 | Yale. |
| Whooping Cough | 2 | 1.4 | Presbyterian, South (2) |
| Typhoid Fever | 3 | 4, 8, 21 | Baptist, South. (3) |
| Influenza | 1 | 19 | American Lutheran. |
| Tuberculosis | 2 | 19, 21 | Other English. |
| Measles | 1 | 4 mo. | Other English. |
| Meningitis | 2 | 10 mo., 26 | Swed. Miss., Bapt., South. |
| Scarlet Fever | 1 | 6 | European C. I. M. |
| Appendicitis | 1 | 4 | Other English. |
| Septic Sore Throat | 1 | 2 | American Board. |
| Malnutrition | 2 | 5 mo., 8 mo. | Y. M. C. A. (2) |
| Premature | 1 | 6 days | C. I. M. |
| Accident | 2 | 14, 15 | Other American, Pres. No. |
| "Seasickness" | 1 | 8 mo. | Other European. |
| Killed in War | 10 | 18, 19 (3)<br>20, 21 (2)<br>23, 25, 26 | London Miss. (2); Other English (2).<br>Eng. Bapt., C. I. M. (5) |
| **Total** | 37 | | |

Thirty-seven deaths are recorded as occurring outside of China. This is 8.2% of the total number of deaths. Of these, five children died on board ship going to or from China. Two others died while in Korea and Japan. So that only 6.6% of the deaths occurred while children were in the homeland. If the deaths from war are excluded, this leaves only 19, or 4.4% of the total deaths. About 33% of the children's life was spent at home. As only 6.6% of the deaths occurred there, there are about five chances of the child dying in China to one of his dying in the homeland. It must be remembered, however, that most of the "homeland" years were those of later childhood, when mortality is lower than in early life.

Sometimes missionaries are accused of a lack of patriotism. Eleven children of English missionaries died in the war, one of disease, and ten killed in battle. In the four societies represented, one-third of the children who have died, aged five years and over, have died while in the service of their country.

## MORBIDITY AMONG CHILDREN

So far this study has been concerned with the deaths of children. Many sicknesses, however, do not result in death, and yet prevent robust health.

The statistics concerning morbidity are not so reliable as those concerning mortality. Sicknesses not resulting in death are more likely to be forgotten. Furthermore, for malaria, dysentery, bronchitis, worms, tonsilitis, the report was often "many times," "occasionally," "not often," etc., in which cases the illness in question was recorded but once. Though the total illnesses are certainly well above the 5,744 here recorded, the figures are of value for comparative purposes within the group. In order to make the comparison as accurate as possible, the sicknesses reported are reduced to the number per 1,000 years of residence. The tables concerning morbidity and general health are based on the histories of 3,036 children only. This gives an average of 1.9 illnesses per child.

**Table 53** ABSOLUTE NUMBER OF CASES OF PRINCIPAL INFECTIONS AND NUMBER PER 1000 YEARS OF RESIDENCE BY PROVINCES.

| SICKNESS | Manchuria | Shantung | Chihli | Shansi | Shensi | Kansu | Kiangsu | Anhwei | Chekiang | Honan | Kiangsi | Hupeh | Hunan Kweichow | Szechuan | Fukien | Kwangtung Yunnan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL YEARS OF RESIDENCE | | | | | | | | | | | | | | | |
| | 331 | 1527 | 1448 | 569 | 593 | 470 | 2359 | 651 | 1083 | 1263 | 476 | 1069 | 850 | 1672 | 886 | 1321 |
| | NUMBER OF SICKNESSES PER 1000 YEARS OF RESIDENCE | | | | | | | | | | | | | | | |
| **Total per 1000 yrs.** | 300 | 245 | 216 | 348 | 200 | 257 | 301 | 203 | 263 | 254 | 247 | 214 | 306 | 203 | 184 | 226 |
| Dysentery | 60 | 24 | 41 | 69 | 32 | 15 | 42 | 18 | 21 | 58 | 50 | 23 | 43 | 23 | 16 | 28 |
| Diarrhea | 21 | 13 | 9 | 17 | 23 | 6 | 9 | 7 | 7 | 5 | 6 | 12 | 16 | 8 | 10 | 9 |
| Bronchitis | 18 | 10 | 15 | 12 | 11 | 6 | 9 | 12 | 12 | 4 | 8 | 12 | 17 | 10 | 6 | 8 |
| Pneumonia | 12 | 10 | 7 | .... | 11 | 6 | 12 | 6 | 6 | 7 | 4 | 9 | 11 | 9 | 7 | 5 |
| Diphtheria | .3 | 5 | 9 | 9 | 2 | 2 | 8 | .... | 6 | 10 | 2 | ..... | 8 | 1.8 | 6 | 5 |
| Smallpox | 3 | 8 | 5 | 19 | 12 | 17 | 2 | .... | 4 | 2 | 2 | 8 | .... | 5 | 7 | 1 |
| Meningitis | ..... | ..... | 0.7 | 4 | .... | ..... | ..... | 3 | .9 | ..... | 2 | 4 | 8 | 1 | .... | .7 |
| Scarlet Fever | 30 | 24 | 13 | 21 | 17 | 34 | 13 | 6 | 7 | 8 | 8 | 4 | 6 | 11 | 1 | 2 |
| Typhoid Fever | 3 | 6 | 5 | 4 | 11 | .... | 7 | .... | 3 | 3 | 2 | 10 | 4 | 2 | .... | 2 |
| Malaria | 12 | 5 | 12 | 10 | 13 | .... | 35 | 18 | 39 | 14 | 38 | 23 | 13 | 19 | 33 | 35 |
| Influenza | 21 | 7 | 10 | 26 | .... | 4 | 6 | 6 | 11 | 5 | 6 | 8 | 8 | 2 | 4 | 5 |
| Measles | 42 | 32 | 30 | 45 | 28 | 61 | 47 | 47 | 32 | 51 | 39 | 33 | 63 | 47 | 31 | 19 |
| Mumps | 12 | 18 | 7 | 10 | 7 | 25 | 16 | 16 | 11 | 11 | 21 | 13 | 6 | 7 | 4 | 13 |
| Chicken Pox | 27 | 26 | 21 | 35 | 20 | 21 | 36 | 24 | 39 | 30 | 29 | 14 | 47 | 16 | 13 | 38 |
| Whooping Cough | 21 | 31 | 21 | 52 | 13 | 42 | 35 | 26 | 56 | 32 | 21 | 24 | 43 | 26 | 30 | 37 |
| Tonsilitis | 12 | 22 | 9 | 14 | 8 | 4 | 15 | 1 | 9 | 16 | 8 | 11 | 2 | 12 | 14 | 15 |
| | NUMBER OF SICKNESSES | | | | | | | | | | | | | | | |
| **Total Sicknesses** | 99 | 373 | 313 | 198 | 119 | 121 | 712 | 136 | 284 | 320 | 118 | 229 | 260 | 340 | 163 | 299 |
| Dysentery | 20 | 37 | 59 | 39 | 19 | 7 | 101 | 12 | 23 | 66 | 24 | 25 | 37 | 38 | 14 | 37 |
| Diarrhea, etc. | 7 | 21 | 14 | 9 | 14 | 3 | 22 | 5 | 8 | 7 | 3 | 14 | 14 | 13 | 9 | 13 |
| Bronchitis | 6 | 15 | 21 | 7 | 6 | 3 | 22 | 88 | 13 | 6 | 4 | 13 | 15 | 17 | 5 | 11 |
| Pneumonia | 4 | 15 | 11 | 4 | 7 | 5 | 29 | 4 | 7 | 8 | 2 | 10 | 9 | 16 | 6 | 6 |
| Diphtheria | 1 | 7 | 14 | 5 | 1 | 1 | 19 | .... | 6 | 13 | 1 | ..... | 3 | 2 | 5 | 6 |
| Smallpox | 1 | 13 | 7 | 11 | 2 | 8 | 4 | .... | 4 | 3 | 1 | 8 | .... | 8 | 6 | 2 |
| Meningitis | ..... | ..... | 1 | 2 | .... | 1 | 4 | 2 | 1 | ..... | 1 | 4 | 3 | 2 | .... | 1 |
| Scarlet Fever | 10 | 37 | 20 | 12 | 9 | 16 | 31 | 4 | 8 | 10 | 4 | 4 | 5 | 19 | 1 | 3 |
| Typhoid Fever | 1 | 9 | 7 | 2 | 7 | .... | 16 | .... | 3 | 4 | 1 | 11 | 4 | 4 | .... | 3 |
| Malaria | 4 | 8 | 17 | 6 | 8 | .... | 84 | 12 | 42 | 18 | 17 | 26 | 11 | 32 | 29 | 46 |
| Influenza | 7 | 10 | 15 | 15 | .... | 2 | 14 | 4 | 11 | 7 | 3 | 9 | 7 | 4 | 4 | 7 |
| Measles | 14 | 48 | 44 | 26 | 17 | 31 | 111 | 31 | 35 | 65 | 19 | 36 | 54 | 80 | 28 | 26 |
| Mumps | 4 | 28 | 10 | 6 | 4 | 12 | 50 | 11 | 11 | 14 | 10 | 14 | 6 | 13 | 4 | 18 |
| Chicken Pox | 9 | 39 | 30 | 20 | 12 | 10 | 86 | 16 | 42 | 38 | 14 | 16 | 38 | 28 | 12 | 51 |
| Whooping Cough | 7 | 50 | 30 | 30 | 8 | 20 | 83 | 17 | 60 | 41 | 10 | 27 | 37 | 44 | 27 | 49 |
| Tonsilitis | 4 | 35 | 13 | 8 | 5 | 2 | 36 | 7 | 10 | 20 | 4 | 12 | 16 | 20 | 13 | 20 |

Table 53 shows both the relative and the absolute number of the principal sicknesses for each of the provinces. It will be observed that the provinces with the largest number of illnesses are not, necessarily, the ones with the highest mortality, *i.e.*, those with the highest absolute number of cases, may not have the highest *percentage* of cases. For instance, Kiangsu reports 101 cases of dysentery—half again the number of the next highest province. But it stands only sixth in the number of cases in relation to the number of years spent in China. The density of the missionary population in the

Yangtse valley gives that section the reputation of an unduly high dysentery rate, which reputation, so far as the children are concerned, is undeserved.

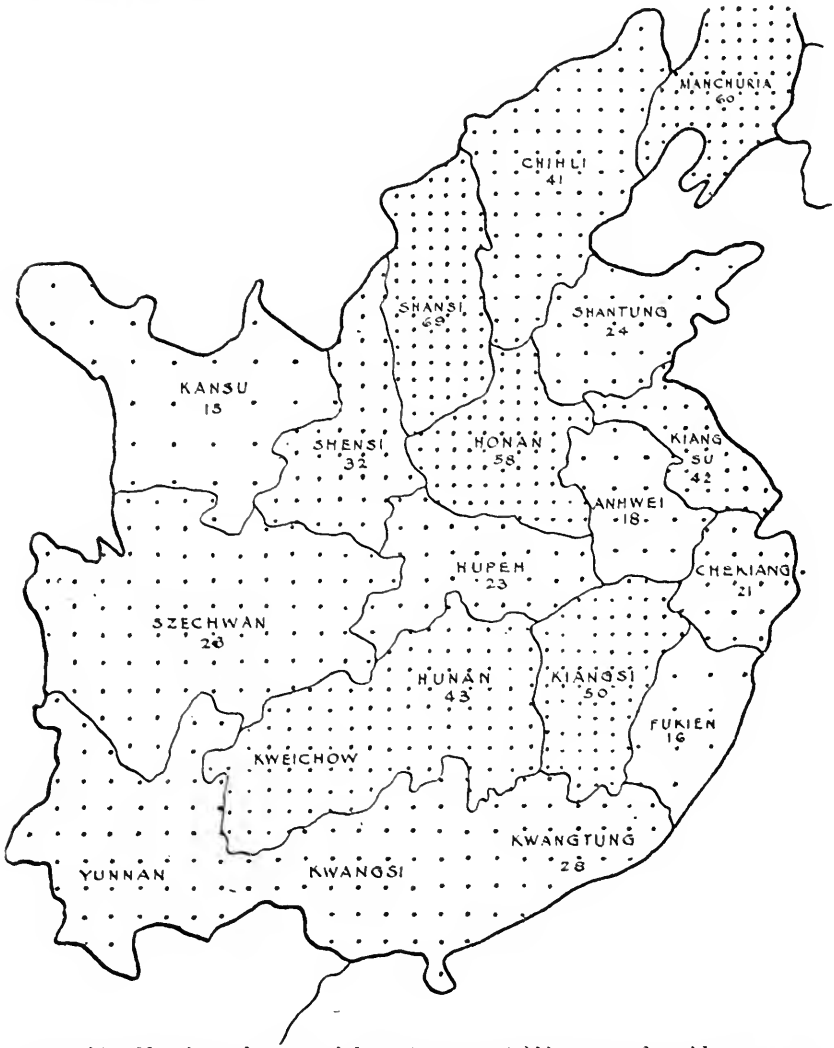


Figure 34. Number of cases of dysentery per 1,000 years of residence among children by provinces (from Table 53). Number of dots represents number of cases per 1,000 years' residence *per unit square of surface, e.g.*, 100 square miles. The figures indicate simply the number of cases per 1,000 years of residence. Absence of boundary lines between provinces indicates that data from these provinces are combined.

The distribution of dysentery shown in Figure 34 is of interest. Provinces reporting most dysentery per 1,000 years

are: Shansi, 69; Manchuria, 60; Honan, 58. A wide gap separates these from the provinces reporting least, viz.: Chekiang, 11; Kansu, 15; Fukien, 16.

Shansi and Kansu have the distinction of reporting the most cases of smallpox. Kansu, Manchuria, Shantung and Shansi have far more scarlet fever than the other provinces. Chekiang, Kiangsi, Kiangsu and Kwangtung report the most malaria. Of the total sicknesses tabulated, Shansi reports the most, Fukien the fewest.

Round worms are not classified in the table. Various provinces reported infection per 1,000 years as follows: Fukien, 41.7; Hunan and Kweichow, 40.4; Kwangtung, 33.3; Hupeh, 29; Chekiang, 26; Kiangsu, 25.8; Honan, 23; Shantung, 21; Szechuan, 20; Chihli, 13.1. Definite sickness from round worms was named but once (jaundice, with death); 13.4% of the children were reported as having had round worms.

The chief diseases for the sections are shown in Figure 35.

Besides the sicknesses listed in the table, the following are reported, the number being too small to make division into provinces of value: Round worms, 402; hook worm, 12; pin worm, 31; operation, tonsil or adenoid, 157; mastoid, 4; hernia, 9; difficult feeding, 90; malnutrition, 29; heart disease, 24; tuberculosis, 23; appendicitis, not operated 11, operated 23; rheumatism, 19; rickets, 13; trachoma, 13; kidney disease, 8; relapsing fever, 5; cholera, 5; tapeworm, 4; St. Vitus dance, 4; cyclic vomiting, 3; erysipelas, 3; mentally defective, 3; kalaazar, 1; infantile paralysis, 2; miscellaneous, 14; total, 812.

**Table 54** NUMBER OF PRINCIPAL INFECTIONS BY SECTIONS OF CHINA, AND OCCURRING OUTSIDE OF CHINA.

| SICKNESS | North | Central | South | All China | Outside China | Province or Years of Residence Not Stated |
|---|---|---|---|---|---|---|
| | Number of Years of Residence | | | | | |
| | 4940 | 9436 | 2227 | 16,573 | 8748 | |
| | Number of Cases of Specified Sickness | | | | | |
| TOTAL | 1227 | 2425 | 462 | 4,114 | 708 | 110 |
| Dysentery | 181 | 326 | 51 | 558 | 14 | 23 |
| Diarrhea, etc. | 68 | 85 | 22 | 175 | 12 | 6 |
| Bronchitis | 59 | 98 | 16 | 173 | 6 | 7 |
| Pneumonia | 46 | 85 | 12 | 143 | 17 | 6 |
| Diphtheria | 29 | 44 | 11 | 84 | 12 | 2 |
| Smallpox | 42 | 28 | 8 | 78 | ------ | 5 |
| Meningitis | 4 | 17 | 1 | 22 | 5 | 0 |
| Scarlet Fever | 104 | 85 | 4 | 193 | 38 | 7 |
| Typhoid Fever | 26 | 43 | 3 | 72 | 10 | 5 |
| Malaria | 43 | 242 | 75 | 362 | 9 | 11 |
| Influenza | 49 | 59 | 11 | 119 | 3 | 0 |
| Measles | 180 | 462 | 54 | 696 | 232 | 3 |
| Mumps | 64 | 129 | 22 | 215 | 68 | 11 |
| Chicken Pox | 120 | 278 | 63 | 461 | 91 | 8 |
| Whooping Cough | 145 | 319 | 76 | 540 | 171 | 11 |
| Tonsilitis | 66 | 125 | 33 | 225 | 19 | 5 |

Table 54 gives the total *number* of sicknesses by sections, together with the sicknesses contracted outside of China.

Diseases contracted outside of China not named in Table 54 are the following: Infantile paralysis, 6; malnutrition, 2; appendicitis, 6; rheumatism, 3; heart trouble, 1; kidney, 1; tuberculosis, 1; round worms, 1; pin worms, 2; erysipelas, 1; total, 24.

The only disease which is not the more common in China is infantile paralysis; two cases were reported from China, as against six reported from outside China.

**Table 55** NUMBER OF PRINCIPAL INFECTIONS PER 1000 YEARS OF RESIDENCE, BY SECTIONS OF CHINA AND OCCURRING OUTSIDE OF CHINA.

| SICKNESS | Number of Cases per 1000 Years of Residence | | | | |
|---|---|---|---|---|---|
| | Occurring in China | | | | Occurring Outside of China |
| | North China | Central China | South China | All China | |
| TOTAL | 248 | 257 | 209 | 249 | 81 |
| Dysentery | 37 | 34 | 23 | 34 | 1.6 |
| Diarrhea, etc. | 13 | 9 | 9 | 11 | 1.4 |
| Bronchitis | 12 | 13 | 7 | 9 | .6 |
| Pneumonia | 11 | 9 | 5 | 8 | 2. |
| Diphtheria | 6 | 5 | 5 | 5 | 1.4 |
| Smallpox | 9 | 3 | 4 | 5 | ----- |
| Meningitis | .8 | 2 | .4 | 1.4 | .5 |
| Scarlet Fever | 21 | 9 | 2 | 12 | 4.3 |
| Typhoid Fever | 5 | 5 | 1 | 4 | 1.1 |
| Malaria | 9 | 25 | 33 | 22 | 1.0 |
| Influenza | 10 | 16 | 5 | 7 | .4 |
| Measles | 36 | 49 | 24 | 42 | 26.6 |
| Mumps | 13 | 14 | 9 | 13 | 7.0 |
| Chicken Pox | 24 | 28 | 28 | 28 | 10.0 |
| Whooping Cough | 29 | 33 | 34 | 33 | 19.9 |
| Tonsilitis | 13 | 13 | 25 | 14 | 2. |

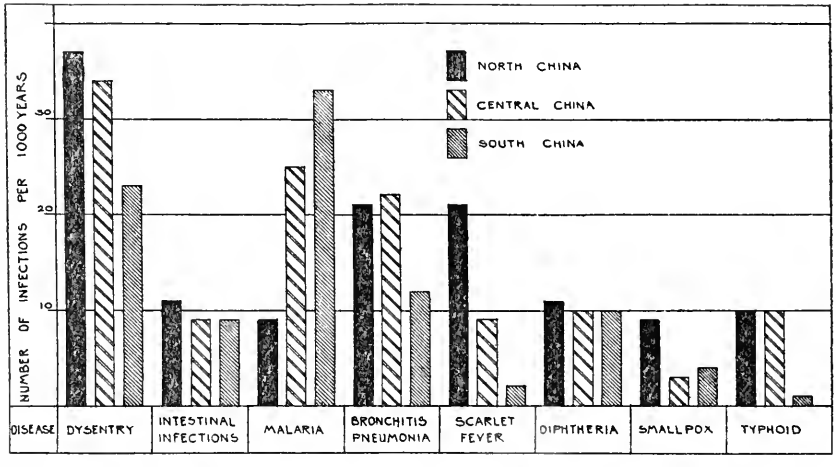


Figure 35. Number of infections of various diseases per 1,000 years' residence by sections of China. (Illustrating part of Table 55.)

Table 55 gives the sicknesses of Table 54 expressed in number of sicknesses per 1,000 years of residence. Central China has a slightly higher morbidity than North China, due to excess of malaria and measles. South China exceeds other sections only in the amount of malaria, tonsilitis and whooping cough. Its total rate would be higher if cases of round worms and all cases of malaria were included. Figure 35 illustrates a portion of Table 55.

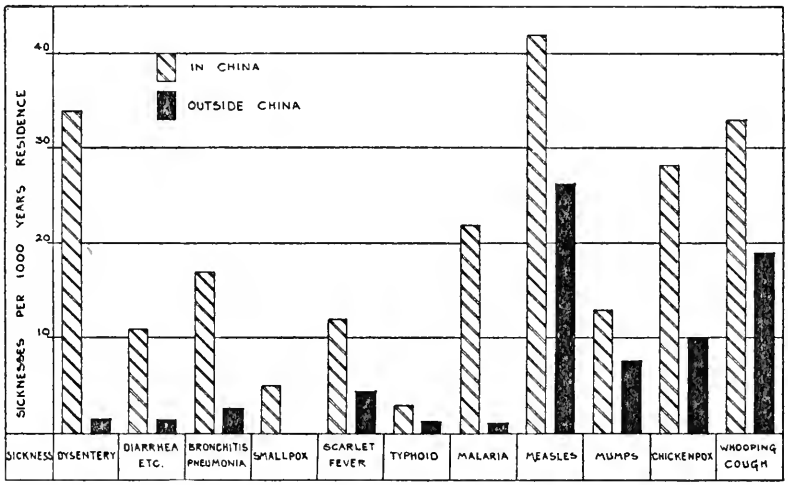


Figure 36. Number of cases per 1,000 years' residence of various diseases contracted in China and outside of China. (Illustrating part of Table 55.)

Figure 36 shows the comparative number of sicknesses contracted in China and outside of China. The highly contagious children's diseases, scarlet fever, measles, mumps, chicken pox, and whooping cough, are contracted while the children are home more frequently than the other diseases. The comparatively low rate of sickness of children while at home is to be accounted for in part by the fact that children are home for school during the later years when they are less susceptible to the serious infections.

## PERCENTAGE OF MORTALITY

We have seen that more children die in the north than in the south. This is partly because more serious diseases are prevalent in the north. But it is also (Table 56 and Figure 37) due to the fact that, for practically all the diseases, the

north shows a higher percentage of mortality than the south. This may be because of greater virulence of the disease, or because of less provision for medical care. It is not because children in the north are less robust. (See Table 61.)

**Table 56** PERCENTAGE OF MORTALITY FOR VARIOUS DISEASES, BY SECTIONS

| DISEASE | North | Central | South | All China |
|---|---|---|---|---|
| Dysentery | 12.1 | 10.4 | 7.8 | 10.0 |
| Diarrhea, etc. | 20.8 | 26.7 | 4.5 | 21.7 |
| Bronchitis | 3.3 | 2.0 | ------ | 2.2 |
| Pneumonia | 28.2 | 17.7 | 8.3 | 20.2 |
| Diphtheria | 34.3 | 25.0 | ------ | 25.0 |
| Smallpox | 28.5 | 35.7 | ------ | 28.1 |
| Meningitis | 75.0 | 58.8 | 10.0 | 63.6 |
| Scarlet Fever | 12.5 | 2.3 | ------ | 7.7 |
| Typhoid Fever | 17.2 | 9.3 | ------ | 12.5 |
| Malaria | 46.5 | 0.8 | 5.3 | 2.2 |
| Measles | 0.5 | ------ | ------ | 0.1 |
| Whooping Cough | 1.4 | ------ | ------ | 0.37 |

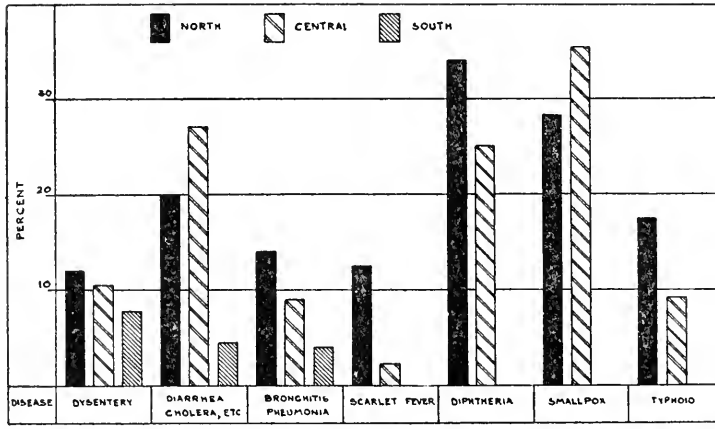


Figure 37. Percentage of mortality for various diseases by sections of China. (Illustrating part of Table 56.)

## MAJOR AND MINOR INFECTIONS

Because of the evident importance of the infections, various infectious diseases are divided, in Tables 57-58, into two classes, and comparison made among provinces and societies as to the number of cases per 1,000 years of life.

The major infections include dysentery, diarrhœa, cholera, etc., pneumonia, tuberculosis, meningitis, typhoid fever, scarlet fever, smallpox, typhus, cholera, malaria, and infantile paralysis. Minor infections include measles, mumps, chicken pox, bronchitis, intestinal worms, etc. Infections contracted both in China and at home are counted.

## GEOGRAPHICAL LOCATION

**Table 57** NUMBER OF INFECTIONS OF CHILDREN BY PROVINCES

| PROVINCE | No. of Infections | | Number of Infections per 1000 Years of Life | |
|---|---|---|---|---|
| | Major | Minor | Major | Minor |
| Manchuria | 53 | 56 | 83. | 94. |
| Shantung | 191 | 307 | 61. | 134. |
| Chihli | 147 | 258 | 78. | 124. |
| Shansi | 99 | 137 | 128. | 161. |
| Shensi | 104 | 75 | 130. | 96. |
| Kansu | 55 | 94 | 85. | 145. |
| North | 649 | 927 | 83. | 128. |
| Kiangsu | 376 | 622 | 116. | 192. |
| Anhwei | 54 | 114 | 62. | 131. |
| Honan | 144 | 250 | 106. | 184. |
| Chekiang | 129 | 299 | 67. | 156 |
| Kiangsi | 50 | 83 | 81. | 134. |
| Hupeh | 121 | 172 | 75. | 107. |
| Hunan | 79 | 188 | 83. | 200. |
| Kweichow | 23 | 27 | 125. | 156. |
| Szechuan | 172 | 288 | 61. | 102. |
| Central | 1148 | 2043 | 84. | 149. |
| Fukien | 91 | 252 | 61. | 170. |
| Kwangtung | 171 | 342 | 77. | 154. |
| Yunnan | 8 | 8 | 85. | 85. |
| South | 270 | 602 | 71. | 159. |
| **All China** | 2067 | 3572 | 81. | 144. |

The major infections are equally frequent in North and Central China, but less frequent in South China. The minor infections, on the other hand, increase from north to south. (This tabulation includes intestinal parasites.)

## MISSIONARY SOCIETIES

**Table 58** NUMBER OF INFECTIONS OF CHILDREN BY SOCIETIES

| SOCIETY | Number of Infections per 1000 Years | |
|---|---|---|
| | Major | Minor |
| English Baptist | 123. | 163. |
| American Church Mission | 113. | 261. |
| Scandinavian Societies | 103 | 102. |
| Y. M. C. A. | 93. | 294. |
| American Baptist, South | 89. | 115. |
| American Lutheran Societies | 84. | 172. |
| American Board | 84. | 135. |
| Other English Societies | 81. | 117. |
| Cand. Methodist | 80. | 145. |
| Other Am. Soc. | 79. | 159. |
| Am. Methodist, No. | 75. | 163. |
| German and Swiss | 70. | 56. |
| Am. Bapt., North | 70. | 117. |
| China Inland | 67. | 122. |
| Church Mis. Soc. | 62. | 83. |
| London Miss. | 58. | 121. |
| Am. Pres., No. | 56. | 147. |
| **All Societies** | 76. | 132. |

In Table 58 the infections are rearranged by societies (the division into societies is somewhat different from that used in previous tables.)

The societies with the smallest number of major infections are not necessarily those with the lowest mortality. This may be due partly to comparative lack of medical care, inland location of stations, etc. It may be, also, that the members of some societies have been less careful than others in naming all the sicknesses.

Note that minor infections do not decrease at the same rate as major infections. Here again the neglect of mentioning the trivial diseases may be a large factor.

## AGE AT TIME OF SICKNESS

It is important to know at what ages children are most liable to contract the various diseases. Age at time of sickness was not recorded for many of the sicknesses. Data concerning nine of the more important diseases, totaling 1,291 sicknesses, are recorded in Table 59.

Children aged two (*i.e.,* during the third year of life) show the largest number of infections. As has been remarked previously, this is the year of greatest susceptibility to unhealthy conditions. During this third year, dysentery and malaria are most common. Diarrhœa and smallpox are most prevalent in the first year—pneumonia in the second, scarlet fever in the sixth.

**Table 59** AGE OF CHILDREN AT TIME OF SICKNESS.

| SICKNESS | Number of Infections Occurring at Ages Specified. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-1 | 1 | 2 | 3 | 4 | 5 | 6-10 | 11-15 | 16 and over | **Total** |
| Dysentery | 63 | 103 | 112 | 54 | 43 | 31 | 41 | 11 | 1 | 459 |
| Diarrhea | 45 | 43 | 21 | 9 | 6 | 4 | 2 | 1 | 1 | 132 |
| Pneumonia | 23 | 37 | 24 | 10 | 6 | 4 | 10 | 1 | 1 | 116 |
| Diphtheria | 6 | 10 | 9 | 6 | 14 | 12 | 21 | 7 | 1 | 86 |
| Smallpox | 17 | 10 | 15 | 5 | 9 | 3 | 11 | 1 | 1 | 72 |
| Scarlet Fever | 5 | 5 | 10 | 15 | 17 | 19 | 46 | 15 | 2 | 134 |
| Typhoid Fever | 4 | 9 | 5 | 4 | 4 | 9 | 16 | 17 | 4 | 72 |
| Malaria | 12 | 13 | 36 | 32 | 20 | 27 | 51 | 12 | 4 | 207 |
| Tuberculosis | 2 | 2 | 1 | ---- | 2 | 1 | 3 | ---- | 2 | 13 |
| **Total** | 177 | 232 | 233 | 135 | 121 | 110 | 201 | 65 | 17 | 1291 |

## MORTALITY RATE IN RELATION TO AGE

Table 60 shows the percentage of the diseases which resulted fatally at various ages. In general, the younger the child, the greater the danger of death. During the first year, for instance, 60% of those contracting smallpox, 47% contracting infectious diarrhœa and 41% contracting dysentery died. These figures are unnaturally high for the reason that practically all the ages at death are known, whereas many of the ages for non-fatal sicknesses are not known.

**Table 60** PERCENTAGE OF SICKNESSES RESULTING IN DEATH AT VARIOUS AGES.

| SICKNESS | Age at Time of Sickness | | | | | |
|---|---|---|---|---|---|---|
| | 0-1 | 1 | 2 | 3 | 4 | 5 and Over |
| | Per Cent | Per Cent | Per Cent | Per Cent | Per Cent | Per Cent |
| Dysentery | 41 | 26 | 9 | 11 | 7 | 5 |
| Diarrhea, etc. | 47 | 40 | 20 | 11 | ------ | 44 |
| Pneumonia | 39 | 29 | 33 | 10 | ------ | 13 |
| Diphtheria | 33 | 70 | 66 | ------ | 21 | 14 |
| Smallpox | 60 | ------ | 20 | ------ | 44 | 16 |
| Scarlet Fever | ------ | 20 | 10 | 7 | 24 | 11 |
| Typhoid Fever | 25 | 33 | 20 | 25 | 25 | 11 |
| Malaria | 16 | 8 | 9 | 6 | ------ | 2 |
| Tuberculosis | 100 | 100 | 100 | ------ | ------ | 62 |

## GENERAL HEALTH OF CHILDREN

### GEOGRAPHICAL LOCATION

Under certain conditions of climate, malnutrition, etc., children may not have had any definite illnesses and yet be in poor health. To cover this point, parents were asked to specify if the past general health of children has been robust, good, fair, or poor. Since these terms are open to individual interpretation, the tabulation of answers received on this point is of value in only the broadest way.

**Table 61** PAST GENERAL HEALTH OF CHILDREN—BY PROVINCES

| PROVINCE | Total No. of Children | Percentage Reporting Health of Children as | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Robust |
| Manchuria | 71 | 3 | 13 | 54 | 30 |
| Shantung | 232 | 3 | 17 | 45 | 35 |
| Chihli | 224 | 1 | 9 | 47 | 43 |
| Shensi | 83 | 4 | 6 | 52 | 38 |
| Shansi | 131 | 5 | 14 | 53 | 28 |
| Kansu | 67 | 3 | 3 | 40 | 54 |
| North China | 808 | 3 | 10 | 47 | 38 |
| Kiangsu | 368 | 3 | 11 | 44 | 41 |
| Anhwei | 78 | 1 | 10 | 36 | 53 |
| Honan | 186 | 4 | 9 | 42 | 44 |
| Chekiang | 170 | ---- | 9 | 47 | 44 |
| Hupeh | 167 | 2 | 9 | 44 | 45 |
| Kiangsi | 56 | 1 | 18 | 52 | 30 |
| Hunan | 156 | 4 | 17 | 47 | 32 |
| Kweichow | 22 | 9 | 19 | 50 | 27 |
| Szechuan | 273 | 2 | 11 | 47 | 43 |
| Central China | 1476 | 3 | 12 | 44 | 40 |
| Fukien | 167 | ---- | 9 | 51 | 40 |
| Kwangtung | 255 | 4 | 11 | 53 | 33 |
| Yunnan | 15 | ---- | ---- | 73 | 27 |
| South China | 437 | 1 | 7 | 59 | 33 |
| **Total All China** | 2721 | 2 | 10 | 50 | 37 |

In Table 61 is given the tabulation by provinces. South China shows the smaller proportion of children whom the parents specify as robust, 33%, as against 38% and 40% for North and Central China. (See Figure 41.)

Though death is less common in the south, robust health is also less frequent. The explanation for this apparent contradiction lies in the fact that diseases of the south are those (such as malaria and intestinal parasites) which cause invalidism rather than death. Also, the climate is more debilitating.

## MISSIONARY SOCIETIES

Table 62 is arranged by societies with those reporting the highest percentage of robust children at the top. There is considerable variation (41%) between the highest and lowest. Only 14% of all children are considered by their parents to be in less than good health.

**Table 62** PAST GENERAL HEALTH OF CHILDREN BY SOCIETIES

| | No. of Children Reported | Percentage Reporting Health as | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Robust |
| Am.Ch. Mis. | 67 | | 12 | 36 | 52 |
| Canadian Meth. | 114 | | 10 | 42 | 48 |
| Am. Baptist No. | 119 | | 7 | 47 | 45 |
| Y. M. C. A. | 109 | 2 | 10 | 43 | 45 |
| Am. Meth. No. | 158 | 2 | 11 | 44 | 44 |
| Ch. Mis. Soc. | 81 | 5 | 7 | 43 | 44 |
| Other Am. Soc. | 519 | 1 | 9 | 47 | 43 |
| Am. Pres. No. | 281 | 2 | 12 | 45 | 40 |
| American Board | 92 | 2 | 14 | 46 | 38 |
| Other Eng. Soc. | 253 | 3 | 11 | 48 | 37 |
| London Mis. Soc. | 73 | 3 | 8 | 53 | 36 |
| Scandinavian Soc. | 204 | 6 | 12 | 49 | 33 |
| China Inland Mis. | 381 | 4 | 11 | 51 | 33 |
| Am. Baptist So. | 99 | 5 | 16 | 51 | 27 |
| German and Swiss | 65 | 5 | 23 | 61 | 11 |
| **Total** | 2615 | 3 | 11 | 47 | 39 |

## MISCARRIAGES AND STILLBIRTHS

An important phase of the problem, but one concerning which little is said, is the number and cause of pregnancies which terminate disastrously. Such miscarriages, and stillbirths, are a heavy drain on the health and spirit of the mothers.

Were it not for difficult living conditions, missionaries should have a very low miscarriage rate because of their freedom from syphilis.

In the Babies' Hospital, New York City, among 193 syphilitic mothers 22.4% of the 427 pregnancies resulted in stillbirth or miscarriage. Among another 150 syphilitic women, 17.2% of 1,001 pregnancies resulted in miscarriage or stillbirth, while in another 150, with 826 pregnancies, who were known to be free from syphilis, the percentage was only 9.4.[22]

Another authority[23] states that 30% of pregnancies in which a parent is syphilitic result in the death of the fœtus, which is three times the rate observed in non-syphilitic families. He states also that 3.5% of infant deaths are due to this disease.

The pregnancies among missionary women which do not result in a living child form 15.2% of the total. This is several per cent higher than we might expect. The excess is accounted for by the unusual amount of travel and work to which missionary wives are subjected.

## GEOGRAPHICAL LOCATION

**Table 63** NUMBER AND PERCENTAGE OF STILLBIRTHS AND MISCARRIAGES BY PROVINCES

| PROVINCE | Number Living Births | STILLBIRTHS | | MISCARRIAGES | | Total Per Cent |
|---|---|---|---|---|---|---|
| | | Number | Per Cent | Number | Per Cent | |
| Manchuria | 85 | 1 | 1.17 | 9 | 10.6 | 11.8 |
| Shantung | 289 | 4 | 1.38 | 26 | 9.9 | 11.3 |
| Chihli | 270 | 5 | 1.85 | 37 | 13.7 | 15.5 |
| Shansi | 154 | 4 | 2.59 | 25 | 17.6 | 20.2 |
| Shensi | 84 | 2 | 2.38 | 5 | 5.2 | 7.6 |
| Kansu | 76 | 2 | 2.63 | 15 | 19.9 | 22.5 |
| North China | 958 | 18 | 1.87 | 118 | 12.7 | 14.6 |
| Anhwei | 94 | ------ | ------ | 11 | 11.6 | 11.6 |
| Honan | 299 | 4 | 1.74 | 24 | 11.3 | 13. |
| Kiangsu | 448 | 4 | .87 | 46 | 10.5 | 11.4 |
| Chekiang | 176 | 4 | 2.27 | 20 | 10. | 12.7 |
| Hunan | 216 | 2 | .92 | 32 | 11.4 | 12.3 |
| Hupeh | 196 | 6 | 3.06 | 25 | 13.3 | 16.4 |
| Kiangsi | 70 | 7 | 1.0 | 15 | 23.7 | 24.7 |
| Szechuan | 311 | 7 | 2.25 | 42 | 13.5 | 15.7 |
| Central China | 1740 | 34 | 1.95 | 215 | 12.8 | 14.7 |
| Fukien | 182 | ------ | ------ | 25 | 14.1 | 14.1 |
| Kwangtung-Yunnan | 324 | 4 | 1.23 | 57 | 19.3 | 20 5 |
| South China | 506 | 4 | .79 | 83 | 17.6 | 18.4 |
| **All China** | 3204 | 59* | 1.84 | 416 | 13.4 | 15.2 |

*In three cases province not specified.

Table 63 gives the number of miscarriages and stillbirths in relation to the number of living births.

Stillbirths formed 1.84% and miscarriages 13.4% of the births. (Data concerning miscarriages was taken from 1,165 histories, which reported 3,044 living births.)

South China has fewer stillbirths and more miscarriages than the other sections. The total percentage for South China is slightly above North and Central China (18.4%, against 14.6% and 14.7%).

As stated before, 15 deaths of which the parent wrote merely "died at birth" are classed as stillbirths. If these were living at the moment of birth, the rate would be 1.38% in place of 1.84%. In the general population of the United States stillbirths average about 4% of living births.

Four families reported 2 stillbirths, 2 reported 3, the rest but 1.

**Table 64** NUMBER OF MISCARRIAGES—BY PROVINCES

| PROVINCE | Number of Families Reporting Specified Number of Miscarriages | | | | | Total Families | Total Miscarriages | Number Miscarriages per Marriage |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | | | |
| Manchuria | 19 | 5 | ------ | ------ | 1 | 25 | 9 | .36 |
| Shantung | 78 | 11 | 3 | 3 | ------ | 95 | 27 | .28 |
| Chihli | 84 | 17 | 5 | 2 | 1 | 109 | 37 | .34 |
| Shensi | 18 | 3 | 1 | ------ | ------ | 22 | 5 | .23 |
| Shansi | 41 | 9 | 2 | 4 | ------ | 56 | 25 | .44 |
| Kansu | 15 | 8 | 2 | 1 | ------ | 26 | 15 | .59 |
| **North** | 255 | 53 | 13 | 10 | 2 | 333 | 118 | .35 |
| Anhwei | 23 | 4 | 2 | 1 | ------ | 30 | 11 | .37 |
| Honan | 57 | 14 | 2 | 2 | ------ | 75 | 24 | .30 |
| Kiangsu | 126 | 18 | 11 | 2 | ------ | 157 | 46 | .29 |
| Chekiang | 49 | 10 | 5 | ------ | ------ | 64 | 20 | .32 |
| Hunan and Kweichow | 64 | 10 | 4 | 2 | 2 | 82 | 32 | .39 |
| Hupeh | 61 | 7 | 6 | ------ | 1 | 75 | 25 | .32 |
| Kiangsi | 21 | 5 | 2 | 2 | ------ | 30 | 15 | .50 |
| Szechuan | 82 | 22 | 7 | 2 | ------ | 113 | 42 | .37 |
| **Central** | 447 | 89 | 38 | 11 | 3 | 626 | 215 | .34 |
| Fukien | 61 | 7 | 2 | 2 | 2 | 74 | 25 | .34 |
| Kwangtung | 86 | 28 | 3 | 5 | 2 | 124 | 57 | .46 |
| Yunnan | 71 | ------ | ------ | ------ | ------ | 8 | 1 | .12 |
| **South** | 163 | 37 | 6 | 7 | 4 | 206 | 83 | .40 |
| **Total** | 892 | 179 | 57 | 28 | 9 | 1165 | 416 | .36 |

Table 64 shows the number of wives having certain numbers of miscarriages, with the average number of miscarriages *per family,* by provinces. By this method of comparison, also, South China has a higher rate than other sections (40, as against 35 for North and 34 for Central China).

23.5% of the wives reported having had one or more miscarriages. Among 1,618 working women questioned in Manchester, New Hampshire,[24] the percentage was only 12.

**Table 65** SUMMARY OF MISCARRIAGES—BY SECTIONS

| SECTION | Percentage Reporting Specified Number | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 |
| North China | 76.6 | 15.9 | 3.9 | 3.0 | 0.6 |
| Central China | 77.4 | 14.2 | 6.2 | 1.7 | 0.4 |
| South China | 75.1 | 17.0 | 2.7 | 3.2 | 1.8 |
| **All China** | 76.5 | 15.3 | 4.8 | 1.1 | 0.7 |

Table 65 shows that three-fourths of the wives have not had a miscarriage, and of those who have had, two-thirds have had only one. There is no great difference in the number by sections.

## MISSIONARY SOCIETIES

**Table 66** NUMBER AND PERCENTAGE OF STILLBIRTHS BY SOCIETIES

| SOCIETIES | STILLBIRTHS | |
|---|---|---|
| | Number | Number per 100 Living Births |
| American Baptist, North | 1 | 1.01 |
| American Church Mission | 2 | 2.56 |
| American Methodist, North | 5 | 2.53 |
| London Mission | 1 | 1.22 |
| Y. M. C. A. | 3 | 2.50 |
| Other American Societies | 2 | .45 |
| Total, First Group | 14 | 1.37 |
| Canadian Methodist | 1 | .74 |
| Church Missionary Society | 4 | 4.25 |
| American Presbyterian, North | 3 | .95 |
| American Lutheran Societies | 2 | 1.45 |
| American Board Mission | 12 | 4.12 |
| English Baptist | 2 | 1.45 |
| Total, Second Group | 24 | 2.16 |
| Other English Societies | --- | --- |
| China Inland Mission | 13 | 2.89 |
| American Presbyterian, South | 1 | .94 |
| Other European Societies | 3 | 1.75 |
| American Baptist, South | --- | --- |
| European China Island Mission | 4 | 2.82 |
| Total, Third Group | 21 | 1.94 |
| **All Societies** | 59 | 1.84 |

Table 66 gives the number of stillbirths by societies. The first group has the fewest.

Only two (3%) of the stillbirths occurred outside China. Cause of stillbirth was stated in only 17 cases, as follows: difficult labor, 8; overwork, 3; sickness, 4; fall, 1; travel, 1.

In the question blanks sent out, persons were asked to make a check mark in case they did not care to answer the question concerning miscarriages. Only one or two blanks were so checked. For the many blanks, therefore, on which nothing was written in the space for miscarriages, it is assumed that there were none. Unrecorded miscarriages would lower the miscarriage rates below the true figure. It is possible that some of the figures in these tables should be higher than they are.

## CAUSES OF MISCARRIAGES

Table 67 gives the parents' statement of the principal causes of the miscarriages, occurring in China, and the number of the pregnancy for each. Sixteen of the 377 are duplicates, two causes being assigned for one miscarriage.

Miscarriages occur slightly later than living births. 35 per cent of living births were first births, while only 23% of miscarriages were first pregnancies. Five per cent of the liv-

**Table 67** CAUSES OF MISCARRIAGES WHICH OCCURRED IN CHINA

| | Total | Number of Miscarriages Occurring During Specified Pregnancy | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | Not Stated |
| General Conditions | | | | | | | | | | | | |
| Overwork | 65 | 10 | 15 | 11 | 6 | 5 | 8 | 3 | 1 | ---- | 1 | 5 |
| Overexertion and Exercise | 37 | 6 | 13 | 7 | 6 | 3 | 1 | 1 | ---- | ---- | ---- | ---- |
| Debility | 11 | ---- | 2 | 1 | 6 | 2 | ---- | ---- | ---- | ---- | ---- | ---- |
| Nervousness | 10 | 1 | 1 | 3 | 1 | 1 | ---- | ---- | 2 | ---- | ---- | ---- |
| Revolution | 9 | 2 | ---- | 2 | 2 | 1 | ---- | 1 | ---- | ---- | ---- | ---- |
| Fright and Anxiety | 7 | 2 | 2 | ---- | 1 | 1 | 1 | ---- | ---- | ---- | ---- | ---- |
| Physical Agents | | | | | | | | | | | | |
| A Fall or Injury | 21 | 3 | 8 | 1 | 3 | 2 | 2 | ---- | ---- | ---- | ---- | 2 |
| Travel—Cart or Barrow | 11 | 3 | 3 | 2 | 1 | ---- | 2 | ---- | ---- | ---- | ---- | ---- |
| —Litter or Chair | 10 | 6 | 3 | ---- | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- |
| —Steamer | 3 | 1 | 2 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| —Rickshaw | 3 | 1 | 1 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| —Not Specified | 7 | 2 | ---- | ---- | 2 | 2 | ---- | ---- | ---- | 1 | ---- | ---- |
| Pelvic Organs Abnormal | 43 | 10 | 6 | 5 | 8 | 5 | 5 | 3 | ---- | ---- | 1 | ---- |
| Sickness | | | | | | | | | | | | |
| Typhoid | 9 | 2 | 4 | 1 | 1 | ---- | ---- | 1 | ---- | ---- | ---- | ---- |
| Eclampsia | 7 | 3 | 1 | 2 | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- |
| Malaria | 6 | 1 | 2 | ---- | 1 | 1 | ---- | ---- | ---- | ---- | ---- | ---- |
| Dysentery | 4 | 1 | ---- | 2 | ---- | 1 | ---- | ---- | ---- | ---- | ---- | 1 |
| Miscellaneous | 10 | 4 | 3 | 2 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Miscellaneous Causes | 8 | 2 | 3 | 1 | 1 | 1 | ---- | ---- | ---- | ---- | ---- | ---- |
| Cause Unknown | 68 | 16 | 12 | 8 | 8 | 6 | 9 | 3 | 2 | ---- | 1 | 3 |
| Cause Not Stated | 28 | 9 | 3 | 5 | 2 | 4 | 3 | ---- | 1 | 1 | ---- | ---- |
| **All Causes** | 377 | 84 | 83 | 56 | 50 | 36 | 31 | 12 | 7 | 2 | 3 | 11 |
| Percentage of Total | 99 | 23 | 23 | 16 | 13 | 9 | 8 | 3 | 2 | 1 | 1 | ---- |

ing births were sixth births or later, whereas 15% of the miscarriages were sixth pregnancies or later.

Overwork and over-exertion seems to cause later miscarriages in larger proportion than travel or sickness.

Eighty-seven per cent (362 out of 416) of all miscarriages occurred in China. Eighty-two per cent of married years were spent in China. Therefore miscarriages were slightly more frequent in China than at home.

Table 68 compares the cause of miscarriage (in the cases in which a cause was assigned) in China and out of China.

In spite of the fact that 27 of the 55 miscarriages due to physical injuries in China were thought due to peculiar modes of travel (cart, rickshaw, etc.) an even higher percentage of this class of miscarriages occurring at home, *i.e.*, 8 out of 11, were assigned to travel as a cause. Practically one-half of all miscarriages, in the opinion of the persons themselves, were due to overwork, debility, nervousness, fright, etc.

Table 68 SUMMARY OF PRINCIPAL CAUSES OF MISCARRIAGE, OCCURRING IN AND OUTSIDE OF CHINA

| CAUSE OF MISCARRIAGE | OCCURRING IN CHINA | | OCCURRING OUTSIDE CHINA | |
|---|---|---|---|---|
| | Number of Miscarriages | Per Cent of Total | Number of Miscarriages | Per Cent of Total |
| General Condition of Health and Work | 139 | 49 | 21 | 49 |
| Physical Injuries and Travel | 55 | 21 | 11 | 25 |
| Abnormality of Pelvic Organs | 43 | 16 | 5 | 11 |
| Sickness | 36 | 14 | 6 | 16 |
| **Total** | 273 | 100 | 43 | 100 |

Twenty-five per cent of miscarriages in China were blamed on "overwork," while 30% of those occurring at home were laid at the same door. This would indicate that furlough is not a time of rest and recuperation for the wife, but one of increased labor.

## CONDITIONS OTHER THAN HEALTH

The welfare of children involves many more considerations than those of physical health. Though this study does not attempt to deal with these, their importance should be recognized.

In some points, such as long separation from parents, lack of contact with large groups of other children, scarcity of high grade schools, missionary children are the losers. In other no less important respects, such as growth in an atmosphere of religion and service, intimate family life, freedom from the dangers of our too complex social life (including attendance on moving picture shows), the broad education of travel, the growth of the cosmopolitan outlook, missionary children are the gainers. The social and religious condition of adult children of missionaries would make an interesting study.

The pictures on the two following pages show groups of missionary children in Peking. The majority are children of doctors. All of the third group have had protective inoculation against typhoid, paratyphoid, and diphtheria.

Prospective missionary candidates—celebrating a birthday, at the Zoo

Missionary children have the finest of playmates—other missionary children. They do not always have as good a play place as have these children

The camel train has arrived, with sod for the playground. Children in China see many interesting things denied to their stay-at-home relatives

A tree about which missionary children have played for fifty years—the only object in the compound left standing by the Boxers

## PART II — Health of Married Adults

### INTRODUCTION

This study is concerned principally with children because (1) of the writer's interest in missionary children and because of the lack of any previous study of them, (2) because the questionnaire method is applicable for the collection of mortality statistics concerning children, as it is not for adults (since most families in which a parent has died are not now on the mission rolls), and (3) because the study of the adult body is too large an undertaking for one person.

It is realized that the good health of adults is of more importance to the missionary cause than the good health of children. The writer has, in a previous paper[25] presented some of the reasons for modern medical care of the missionary body. It is encouraging to note that some of the boards have undertaken the study of the health of their workers (see pages 95 and 112). Such studies are, however, rare and it seems worth while to present such facts concerning adults as are furnished by this questionnaire.

Fifteen hundred and seventy-seven adults, about 60% of those who returned the question blanks, made statement concerning their own health. These had spent some 17,600 years in China, during which time they had contracted nearly 1,500 cases of sickness.

There are some duplications due to the fact that some parents are also children of missionaries still on the field. Though a number of these duplicates have been eliminated, probably a few remain.

## FACTS CONCERNING RESIDENCE AND MARRIAGE

Table 69 (based on 1,064 reports) shows the average length of married life and the proportion spent in China. Those in the north have been married longer than those in the south. The proportion of married life spent in China is nearly the same for the three sections.

**Table 69** AVERAGE NUMBER OF MARRIED YEARS AND PROPORTION SPENT IN CHINA—BY PROVINCES.

| PROVINCE | Number Reporting | Total Since Marriage | No. Married Years In China | Average No. Married Years | | Per Cent of Married Life In China |
|---|---|---|---|---|---|---|
| | | | | Since Marriage | In China | |
| Manchuria | 23 | 264 | 337 | 11.4 | 10.3 | 90 |
| Shantung | 77 | 1166 | 890 | 15.1 | 11.6 | 76 |
| Chihli | 101 | 1098 | 883 | 10.9 | 8.7 | 80 |
| Shansi | 25 | 330 | 277 | 13.1 | 11.1 | 84 |
| Kansu | 23 | 335 | 299 | 14.5 | 13.0 | 89 |
| **North China** | 297 | 3744 | 3006 | 12.6 | 10.1 | 80 |
| Kiangsu | 150 | 1858 | 1517 | 12.4 | 10.1 | 73 |
| Anhwei | 26 | 392 | 323 | 15.0 | 10.9 | 72 |
| Honan | 71 | 672 | 593 | 9.5 | 8.3 | 88 |
| Chekiang | 64 | 932 | 801 | 14.5 | 12.5 | 86 |
| Kiangsi | 23 | 289 | 241 | 12.6 | 10.5 | 83 |
| Hupeh | 62 | 660 | 561 | 10.6 | 9.0 | 85 |
| Hunan | 67 | 550 | 430 | 8.2 | 6.4 | 78 |
| Kweichow | 9 | 128 | 121 | 14.2 | 13.5 | 95 |
| Szechuan | 99 | 1127 | 913 | 11.4 | 9.2 | 81 |
| **Central China** | 571 | 6608 | 5500 | 11.5 | 9.6 | 83 |
| Fukien | 168 | 727 | 570 | 10.7 | 8.4 | 73 |
| Kwangtung | 110 | 1216 | 971 | 11.0 | 8.9 | 80 |
| Yunnan | 18 | 64 | 49 | 8.0 | 6.2 | 77 |
| **South China** | 196 | 2007 | 1590 | 10.2 | 8.1 | 79 |
| **All China** | 1064 | 12359 | 10096 | 11.6 | 9.4 | 81 |

Table 69 referred to *Married* years. Table 70 gives the years—whether married or unmarried—spent in China. Since the average years in China are 11.2, and the married years but 9.4, many persons must have been married after being on the field for a period. Here, as in Table 69, the missionaries in North China have been the longer on the field. This would indicate that the average missionary life in South China is shorter than in the north by 20%.

This proportion holds good for both *married* years and *total* years. Not only have couples in North China been in China longer, but also they have been married longer. This means that the *percentage* of married life spent in China is about the same for the three sections. Married years in China are exclusive of periods in which both parents were on furlough.

**Table 70** *AVERAGE* NUMBER OF YEARS ADULTS (NOW MARRIED) HAVE BEEN RESIDENTS IN CHINA—BY PROVINCES

| PROVINCE | Number Reporting | | Av. Yrs. in China | | Total Husband and Wife | | Total Years |
|---|---|---|---|---|---|---|---|
| | Husband | Wife | Husband | Wife | Number Reporting | Av. Yrs. in China | |
| Manchuria | 10 | 12 | 10.9 | 9.2 | 22 | 10. | 222 |
| Shantung | 42 | 46 | 12.9 | 13.4 | 88 | 13.3 | 1171 |
| Chihli | 63 | 62 | 11. | 10.4 | 125 | 10.7 | 1338 |
| Shansi | 34 | 32 | 12.8 | 11. | 66 | 11.9 | 788 |
| Shensi | 16 | 13 | 10.8 | 9.8 | 29 | 10.3 | 316 |
| Kansu | 15 | 15 | 16.5 | 17.1 | 30 | 16.8 | 497 |
| **North China** | 180 | 180 | 12.5 | 11.8 | 360 | 12.2 | 4388 |
| Kiangsu | 86 | 88 | 11 | 9.8 | 174 | 10.4 | 1817 |
| Anhwei | 13 | 9 | 17.3 | 14. | 22 | 16. | 351 |
| Chekiang | 22 | 22 | 16. | 15.2 | 44 | 15.6 | 687 |
| Honan | 49 | 45 | 11.5 | 9.8 | 94 | 10.6 | 1004 |
| Kiangsi | 26 | 35 | 12.2 | 14. | 61 | 13.1 | 791 |
| Hupeh | 28 | 21 | 14. | 11.8 | 49 | 13.2 | 638 |
| Hunan | 36 | 38 | 8.1 | 7.7 | 74 | 7.9 | 583 |
| Kueichow | 32 | 31 | 11.5 | 9.6 | 63 | 10.6 | 667 |
| Szechuan | 62 | 54 | 12.3 | 12.3 | 116 | 12.3 | 1426 |
| **Central China** | 354 | 343 | 11.8 | 10.9 | 697 | 11.4 | 7933 |
| Fukien | 50 | 42 | 8.1 | 9.4 | 92 | 9.7 | 805 |
| Kwangtung | 76 | 73 | 10.5 | 9.5 | 149 | 10. | 1497 |
| Yunnan | 5 | 8 | 21. | 12.6 | 13 | 15.8 | 207 |
| **South China** | 131 | 123 | 10. | 9.5 | 254 | 9.8 | 2494 |
| **For All China** | 665 | 646 | 11.6 | 10.8 | 1311 | 11.2 | 14663 |

**Table 71** NUMBER OF YEARS ADULTS (NOW MARRIED) HAVE BEEN RESIDENTS IN CHINA—BY PROVINCES

| PROVINCE | Number Resident in China Specified Number of Years | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | 0-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 35-39 | |
| Manchuria | 3 | 9 | 8 | 2 | 1 | ---- | ---- | ---- | 23 |
| Shantung | 19 | 23 | 14 | 11 | 9 | 10 | 2 | ---- | 88 |
| Chihli | 49 | 23 | 15 | 17 | 9 | 5 | 7 | ---- | 125 |
| Shansi | 21 | 12 | 13 | 10 | 3 | 5 | ---- | 1 | 65 |
| Shensi | 4 | 10 | 4 | 4 | 2 | 2 | ---- | ---- | 26 |
| Kansu | 2 | 4 | 4 | 5 | 5 | 5 | ---- | ---- | 25 |
| **North China** | 98 | 81 | 58 | 49 | 29 | 27 | 9 | 1 | 352 |
| Kiangsu | 55 | 49 | 25 | 29 | 13 | 4 | 1 | ---- | 176 |
| Anhwei | 6 | 2 | ---- | 3 | 8 | 3 | ---- | ---- | 22 |
| Chekiang | 8 | 4 | 7 | 13 | 8 | 2 | ---- | 2 | 44 |
| Honan | 37 | 15 | 15 | 13 | 10 | 2 | 2 | ---- | 94 |
| Kiangsi | 2 | 24 | 20 | 7 | 5 | 2 | 1 | ---- | 61 |
| Hupeh | 21 | 5 | 1 | 8 | 9 | 1 | 1 | ---- | 46 |
| Hunan | 24 | 60 | 37 | 7 | 5 | 2 | ---- | ---- | 135 |
| Szechuan | 17 | 44 | 24 | 13 | 11 | 3 | 2 | ---- | 114 |
| **Central China** | 170 | 203 | 129 | 93 | 69 | 19 | 7 | 2 | 692 |
| Fukien | 36 | 24 | 19 | 10 | 3 | 3 | ---- | ---- | 95 |
| Kwangtung | 46 | 53 | 31 | 15 | 4 | 6 | 3 | ---- | 158 |
| **South China** | 82 | 77 | 50 | 25 | 7 | 9 | 3 | ---- | 253 |
| **All China—Husband** | 167 | 172 | 132 | 82 | 64 | 30 | 13 | 2 | 662 |
| Wife | 183 | 189 | 105 | 85 | 41 | 25 | 6 | 1 | 635 |
| **All China—Husband and Wife** | 350 | 361 | 237 | 167 | 105 | 55 | 19 | 3 | 1297 |

Table 71 presents the number of years adults have been resident in China, exclusive of time on furlough, by provinces. Fifty-five per cent have been in China ten years or less, and but 13% for 20 years or more. Table 70 showed that wives had spent 7% less time in China than their husbands. This table shows that the wives who have been in China ten years or less are relatively more numerous than the husbands.

**Table 72** NUMBER AND YEARS OF MARRIED LIFE AND PERCENTAGE OF MARRIED LIFE SPENT IN CHINA—BY SOCIETIES

| SOCIETY | Total No. Married Years | | | Number Married Years Spent in China | | | Per Cent of Married Yrs. in China |
|---|---|---|---|---|---|---|---|
| | No. Families Reporting | No. of Years | Average No. of Years | No. Families Reporting | No. of Years | Average No. of Years | |
| American Baptist, North | 44 | 518 | 11.7 | 44 | 403 | 9.1 | 77 |
| American Church Mission | 44 | 335 | 7.6 | 38 | 185 | 4.8 | 55 |
| Am. Methodist, North | 73 | 961 | 13.1 | 72 | 824 | 11.4 | 85 |
| London Mission | 34 | 426 | 12.5 | 29 | 287 | 9.8 | 91 |
| Y. M. C. A. | 63 | 465 | 7.3 | 63 | 290 | 4.6 | 62 |
| Other American Societies | 225 | 2194 | 9.7 | 214 | 1613 | 7.5 | 73 |
| **Total 1st Group** | 481 | 4899 | 10.2 | 458 | 3436 | 7.5 | 70 |
| Canadian Methodist | 47 | 437 | 9.2 | 45 | 316 | 7.02 | 72 |
| Church Miss. Society | 38 | 434 | 11.4 | 30 | 335 | 11.1 | 81 |
| Am. Presbyterian, North | 125 | 1532 | 12.2 | 113 | 1254 | 11.09 | 82 |
| Am. Lutheran Societies | 53 | 353 | 6.6 | 46 | 264 | 5.7 | 75 |
| Am. Board Mission | 51 | 607 | 11.9 | 51 | 479 | 9.4 | 77 |
| English Baptist | 34 | 400 | 11.7 | 29 | 209 | 7.1 | 52 |
| **Total 2nd Group** | 348 | 3756 | 10.9 | 314 | 2856 | 9.1 | 76 |
| Other English Societies | 103 | 1398 | 13.4 | 97 | 1112 | 11.4 | 79 |
| China Inland Mission | 151 | 2091 | 13.8 | 139 | 1733 | 11.7 | 82 |
| Am. Presybterian, South | 28 | 436 | 15.5 | 28 | 382 | 13.6 | 87 |
| Other European Societies | 63 | 720 | 11.4 | 61 | 607 | 10.0 | 84 |
| Am. Baptist, South | 41 | 638 | 15.5 | 38 | 448 | 11.7 | 70 |
| European C. I. M. | 41 | 484 | 11.8 | 38 | 399 | 10.5 | 82 |
| **Total 3rd Group** | 429 | 5768 | 13.5 | 406 | 4681 | 11.5 | 81 |
| Societies Not Stated | 2 | 28 | 14. | 2 | 26 | 13. | 92 |
| **Total** | 1259 | 14450 | 11.4 | 1179 | 10996 | 9.3 | 77 |
| MARRIED; years not stated (average taken) | 40 | 456 | 11.4 | 122 | 1133 | 9.3 | ------ |
| **Grand Total** | 1300 | 14906 | 11.4 | 1300 | 12132 | 9.3 | 81 |

Table 72 (based on 1,300 reports) shows the married years, and the portion spent in China according to societies, arranged in the order of child mortality, the lowest at the top. For the three big groups, child mortality, as has been seen, varies with the average age of the children.

This table shows, as one would expect, that mortality varies also with the length of time of marriage. It also shows (last column) that mortality for the big group varies *inversely* with the time spent on the field, *i.e.*, the first group, in which parents have spent only seven of ten married years on the field, have a lower rate than the group which have spent eight out of ten. This may mean that the first group has had more frequent furloughs, or a larger period of marriage before coming to the field.

A separate tabulation (table not printed) for families with and without children, shows that families with children of group 1 have been married 10.7 years; of group 2, 11.3 years, and of group 3, 13.5 years. Those without children have been married only about half this number of years.

## MORTALITY AMONG ADULTS

As has been explained, this questionnaire method is of no value for arriving at a mortality rate for adults. However, the list of diseases of which parents have died is of interest. Of 72 married adults who had died, the following are the stated causes of death. Dysentery, 9; typhoid, 6; cancer, 6; tuberculosis, 5; childbirth, 5; 4 each of smallpox, typhus, and malaria; 3 each of pneumonia, puerperal fever, cholera, sprue, and kidney disease; 2 each of apoplexy, heart trouble, and appendicitis, and 1 each of fever, sunstroke, blood poisoning, hemorrhage, operation, meningitis, diarrhœa, and uræmia. Fifty—more than two-thirds—were due to infections. Eight mothers died of diseases caused by confinement, of whom three died of childbirth fever.

Of missionaries who died during 1917, as reported by the China Mission Year Book, 28 of the 56 deaths in which cause of death was recorded, died of infectious diseases. The list includes: typhus fever, 5; typhoid fever, 4; dysentery, 3; smallpox, 2. An interesting fact is the comparative immunity enjoyed by missionaries in China during the influenza pandemic of that year. 30% of missionaries dying *outside* of China died of influenza, whereas only 2% (viz., one) of those dying *in* China succumbed to that disease.

## MORBIDITY AMONG ADULTS

Table 73 shows the number of illnesses in order of frequency for husband and wife by provinces.

## GEOGRAPHICAL LOCATION

**Table 73** INCIDENCE OF PRINCIPAL INFECTIONS AMONG ADULTS BY PROVINCES

| SICKNESSES | Sex | Manchuria | Shantung | Chihli | Shansi | Shensi | Kansu | Kiangsu | Anhwei | Honan | Chekiang | Kiangsi | Hupeh | Hunan Kweichow | Szechuan | Fukien | Kwantung Yunnan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PROVINCE | | | | | | | | | | | | | | | |
| | | NUMBER OF PERSONS REPORTING | | | | | | | | | | | | | | | |
| | Male | 17 | 63 | 77 | 40 | 15 | 18 | 101 | 16 | 41 | 53 | 17 | 41 | 59 | 74 | 54 | 91 |
| | Female | 16 | 65 | 81 | 42 | 15 | 18 | 106 | 17 | 43 | 57 | 18 | 45 | 59 | 74 | 55 | 89 |
| | **Total** | 33 | 128 | 158 | 82 | 30 | 36 | 207 | 33 | 84 | 110 | 35 | 86 | 118 | 148 | 109 | 180 |
| | | NUMBER OF CASES OF SICKNESS PER 100 PERSONS | | | | | | | | | | | | | | | |
| **Total—All Sicknesses** | Male | 102 | 56 | 56 | 55 | 48 | 94 | 86 | 100 | 85 | 99 | 147 | 112 | 105 | 65 | 78 | 100 |
| | Female | 96 | 71 | 69 | 69 | 34 | 50 | 105 | 65 | 81 | 65 | 156 | 69 | 106 | 54 | 71 | 85 |
| | **Both** | 87 | 63 | 62 | 61 | 40 | 72 | 95 | 82 | 85 | 81 | 151 | 89 | 106 | 60 | 74 | 93 |
| Total of Sicknesses Listed Below | Male | 90 | 56 | 50 | 52 | 42 | 85 | 82 | 94 | 79 | 92 | 135 | 106 | 102 | 61 | 74 | 92 |
| | Female | 60 | 59 | 49 | 52 | 14 | 25 | 88 | 53 | 49 | 51 | 130 | 66 | 95 | 48 | 65 | 84 |
| | **Both** | 75 | 57 | 50 | 52 | 24 | 54 | 85 | 73 | 63 | 70 | 131 | 88 | 98 | 54 | 68 | 88 |
| Malaria | Male | 6 | 8 | 6 | 7 | ---- | 30 | 21 | 48 | 29 | 45 | 59 | 30 | 25 | 20 | 27 | 35 |
| | Female | 6 | 5 | 5 | 7 | ---- | 12 | 30 | 24 | 5 | 23 | 55 | 20 | 20 | 8 | 23 | 32 |
| | **Both** | 6 | 6 | 5 | 7 | ---- | 21 | 25 | 36 | 17 | 34 | 57 | 25 | 22 | 14 | 25 | 3 |
| Dysentery | Male | 30 | 17 | 13 | 17 | 13 | 18 | 14 | 24 | 17 | 19 | 29 | 37 | 35 | 16 | 9 | 17 |
| | Female | 18 | 14 | 7 | 12 | 13 | 6 | 18 | ---- | 24 | 7 | 17 | 9 | 27 | 7 | 9 | 12 |
| | **Both** | 24 | 15 | 10 | 15 | 13 | 11 | 16 | 12 | 21 | 13 | 23 | 25 | 32 | 12 | 9 | 15 |
| Typhoid Fever | Male | 24 | 6 | 12 | 5 | 7 | 22 | 7 | 6 | 10 | 5 | 12 | 15 | 10 | 12 | 9 | 5 |
| | Female | 19 | 9 | 2 | 7 | ---- | 6 | 9 | 18 | 7 | ---- | 22 | 9 | 10 | 9 | 2 | 3 |
| | **Both** | 22 | 7 | 7 | 6 | 4 | 14 | 8 | 12 | 8 | 3 | 17 | 12 | 10 | 10 | 5 | 4 |
| Nervous Breakdown | Male | 6 | 1 | 1 | 7 | ---- | ---- | 9 | ---- | 2 | 5 | ---- | 7 | 5 | 3 | 2 | 7 |
| | Female | 12 | 6 | 5 | 2 | ---- | ---- | 4 | 6 | 2 | 7 | ---- | 5 | 10 | 6 | 2 | 7 |
| | **Both** | 9 | 3 | 3 | 4 | ---- | ---- | 7 | 3 | 2 | 6 | ---- | 6 | 7 | 4 | 2 | 7 |
| Influenza | Male | ---- | 8 | 8 | 2 | 7 | 6 | 6 | 6 | 2 | 2 | ---- | 7 | 5 | 1 | 6 | 4 |
| | Female | ---- | 5 | 6 | 5 | ---- | ---- | 5 | ---- | 2 | 4 | ---- | 7 | 2 | 1 | 6 | 3 |
| | **Both** | ---- | 6 | 7 | 3 | 3 | 3 | 5 | 3 | 2 | 3 | ---- | 7 | 3 | 1 | 6 | 3 |
| Diarrhea, etc. | Male | 24 | ---- | 3 | ---- | ---- | ---- | 4 | ---- | 2 | 2 | 12 | 5 | 5 | 4 | 4 | 7 |
| | Female | ---- | 5 | 4 | ---- | ---- | ---- | 4 | ---- | ---- | 2 | 28 | ---- | 7 | 3 | 8 | 6 |
| | **Both** | 12 | 2 | 3 | ---- | ---- | ---- | 4 | ---- | 1 | 2 | 20 | 2 | 6 | 3 | 6 | 6 |
| Roundworms | Male | ---- | 5 | 3 | 2 | ---- | ---- | 6 | ---- | 2 | 5 | 6 | ---- | 2 | ---- | 13 | 8 |
| | Female | ---- | ---- | 1 | 2 | ---- | ---- | 5 | 6 | ---- | 4 | ---- | ---- | 3 | 1 | 11 | 7 |
| | **Both** | ---- | 3 | 2 | 2 | ---- | ---- | 5 | 3 | 1 | 5 | 3 | ---- | 3 | 1 | 12 | 8 |
| Sprue | Male | ---- | 1 | ---- | ---- | ---- | ---- | 5 | ---- | 5 | ---- | 12 | ---- | ---- | ---- | ---- | ---- |
| | Female | ---- | 5 | 1 | 5 | ---- | ---- | 3 | ---- | ---- | 2 | ---- | 7 | 5 | 7 | 4 | 7 |
| | **Both** | ---- | 3 | 1 | 2 | ---- | ---- | 4 | ---- | 2 | 1 | 6 | 3 | 2 | 4 | 2 | 4 |
| Appendicitis Operation | Male | ---- | 3 | 1 | ---- | 6 | ---- | 5 | ---- | ---- | 5 | ---- | 5 | 3 | 4 | 2 | ---- |
| | Female | 6 | 3 | 1 | ---- | ---- | 5 | 4 | 6 | ---- | 2 | 6 | ---- | 5 | ---- | ---- | 1 |
| | **Both** | 3 | 3 | 1 | ---- | 3 | 3 | 4 | 3 | ---- | 4 | 3 | 2 | 4 | 2 | 1 | 1 |
| Smallpox | Male | ---- | 1 | ---- | 2 | ---- | ---- | ---- | 6 | ---- | ---- | ---- | 5 | ---- | ---- | ---- | 3 |
| | Female | ---- | 5 | 6 | 5 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | 1 |
| | **Both** | ---- | 3 | 3 | 3 | ---- | ---- | 1 | 3 | ---- | ---- | ---- | 3 | ---- | ---- | ---- | 2 |
| Typhus Fever | Male | ---- | 3 | 4 | 5 | 7 | 6 | 1 | ---- | 5 | ---- | ---- | ---- | 3 | 4 | ---- | 1 |
| | Female | ---- | ---- | 6 | 7 | ---- | ---- | 3 | ---- | 2 | ---- | ---- | ---- | 3 | ---- | ---- | ---- |
| | **Both** | ---- | 1 | 5 | 6 | 3 | 3 | 2 | ---- | 3 | ---- | ---- | ---- | 3 | 2 | ---- | 1 |
| Tuberculosis | Male | ---- | ---- | ---- | 2 | ---- | ---- | 2 | ---- | ---- | 2 | 6 | ---- | 3 | ---- | ---- | 4 |
| | Female | ---- | 1 | 1 | ---- | ---- | ---- | ---- | ---- | 2 | ---- | 6 | 7 | 2 | ---- | ---- | ---- |
| | **Both** | ---- | 1 | 1 | 1 | ---- | ---- | 1 | ---- | 1 | 1 | 6 | 3 | 2 | ---- | ---- | 2 |
| Scarlet Fever | Male | ---- | ---- | ---- | ---- | ---- | ---- | 2 | ---- | 2 | ---- | ---- | ---- | 3 | ---- | ---- | 1 |
| | Female | ---- | 1 | 4 | 2 | ---- | ---- | 1 | ---- | 2 | ---- | ---- | ---- | 2 | ---- | ---- | ---- |
| | **Both** | ---- | 1 | 2 | 1 | ---- | ---- | 2 | ---- | 2 | ---- | ---- | ---- | 2 | ---- | ---- | 1 |

Since many did not state ages or years of residence, the reckoning is on the basis of the number of persons. This is a bit unfair to the Northern provinces, since the adults in the North have averaged more years in China than those in the South. As in the similar table for children, the recorded number of illnesses from malaria, dysentery, diarrhœa, round worms, etc., is far below the actual number, since many reinfections are not recorded.

It will be noted at once that the distribution of certain diseases is not the same as for the children. Acute intestinal infections, dysentery, diarrhœa and typhoid are relatively more common in Central China than was the case with the children. This is especially true of dysentery. The fact that bacillary dysentery is more prevalent in the north and amebic dysentery in the south may have something to do with this phenomenon. The rarity of amebic dysentery among Filipino children has been noted by Haughwout.[26]

A needed piece of research is an investigation into the incidence of the two types of dysentery among the Chinese, both adults and children, and for the various sections of China.

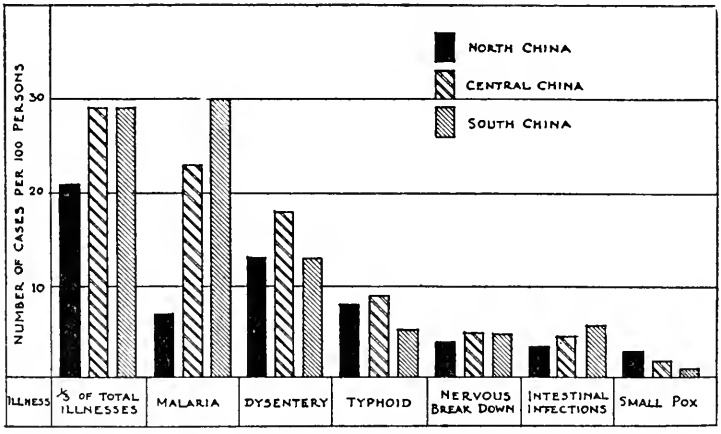


Figure 38. Number of various sicknesses per 100 married missionaries by sections. (Illustrating part of Table 74.)

Table 74 is a compression of Table 73 into groups of provinces. The distribution of the principal diseases is illustrated in Figure 38.

**Table 74** NUMBER OF SICKNESSES PER 100 MARRIED MISSIONARIES, IN ORDER OF FREQUENCY—BY SECTIONS

| SICKNESSES | SEX | North China | Central China | South China | All China | Total Number of Cases of Sickness |
|---|---|---|---|---|---|---|
| | | Number of Persons Reporting | | | | |
| | Male | 230 | 492 | 145 | 777 | |
| | Female | 237 | 419 | 144 | 800 | |
| | Total | 467 | 821 | 289 | 1577 | |
| | | Number of Sicknesses per 100 Persons | | | | |
| **Total—All Sicknesses** | Male | 60 | 92 | 92 | 83 | 644 |
| | Female | 66 | 84 | 86 | 76 | 630 |
| | Both | 63 | 88 | 89 | 81 | 1274 |
| Total of Sicknesses Listed Below | Male | 59 | 88 | 84 | 79 | 606 |
| | Female | 49 | 71 | 76 | 66 | 524 |
| | Both | 52 | 79 | 80 | 72 | 1130 |
| Malaria | Male | 8 | 29 | 32 | 23 | 182 |
| | Female | 5 | 21 | 28 | 18 | 144 |
| | Both | 7 | 25 | 30 | 21 | 326 |
| Dysentery | Male | 16 | 22 | 14 | 19 | 149 |
| | Female | 11 | 14 | 11 | 13 | 103 |
| | Both | 13 | 18 | 13 | 15 | 250 |
| Typhoid Fever | Male | 10 | 9 | 8 | 7 | 72 |
| | Female | 6 | 8 | 3 | 7 | 55 |
| | Both | 8 | 9 | 5 | 8 | 127 |
| Nervous Breakdown | Male | 3 | 5 | 5 | 4 | 34 |
| | Female | 5 | 5 | 5 | 5 | 40 |
| | Both | 4 | 5 | 5 | 5 | 74 |
| Influenza | Male | 6 | 4 | 5 | 5 | 37 |
| | Female | 4 | 3 | 4 | 4 | 29 |
| | Both | 5 | 3 | 4 | 4 | 66 |
| Intestinal Infection, Diarrhea, etc. | Male | 3 | 4 | 6 | 4 | 31 |
| | Female | 3 | 4 | 6 | 4 | 31 |
| | Both | 3 | 4 | 6 | 4 | 62 |
| Roundworms | Male | 3 | 3 | 12 | 4 | 33 |
| | Female | 1 | 3 | 9 | 3 | 25 |
| | Both | 2 | 3 | 10 | 4 | 58 |
| Sprue | Male | ------ | 2 | ------ | 1 | 10 |
| | Female | 3 | 4 | 6 | 4 | 29 |
| | Both | 2 | 3 | 3 | 2 | 39 |
| Appendicitis Operation | Male | 2 | 3 | 1 | 2 | 17 |
| | Female | 2 | 3 | 1 | 2 | 19 |
| | Both | 2 | 3 | 1 | 2 | 36 |
| Scarlet Fever | Male | ------ | 1 | 1 | 1 | 5 |
| | Female | 2 | 1 | ------ | 1 | 9 |
| | Both | 1 | 1 | ------ | 1 | 14 |
| Smallpox | Male | 1 | 2 | 2 | 2 | 11 |
| | Female | 4 | 1 | 1 | 2 | 17 |
| | Both | 3 | 2 | 1 | 2 | 28 |
| Typhus Fever | Male | 4 | 2 | 1 | 2 | 19 |
| | Female | 2 | 1 | ------ | 1 | 11 |
| | Both | 3 | 2 | ------ | 2 | 30 |
| Tuberculosis | Male | ------ | 2 | 1 | 2 | 8 |
| | Female | 1 | 1 | 3 | 1 | 12 |
| | Both | 1 | 1 | 2 | 2 | 20 |

Malaria and dysentery are more frequent among men than women. This may be because of greater conscientiousness on the part of the wives in guarding against infection, or because they do not travel about so much as their husbands. Also, the wives have not been in China as long as their husbands. (Table 71.) Sprue is much more prevalent among wives. Nervous breakdowns are only slightly more frequent. (Figure 39.)

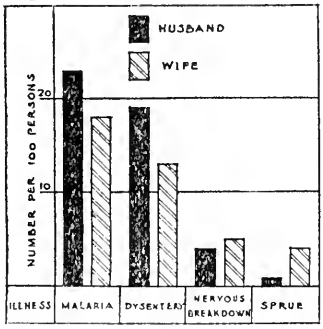


Figure 39. Incidence of certain sicknesses among husbands and wives. (Illustrating part of Table 74.)

In addition to the cases of sickness listed in the table, the following causes of sickness among married missionaries were named: Pelvic operations, 41; puerperal fever, 11; eclampsia, 9; obstetric disaster, 4; ectopic pregnancy, 2; pneumonia, 21; cholera, 14; heart disease, 12; kidney disease, 12; diphtheria, 11; cancer, 8; dengue, 8; meningitis, 4; tapeworm, 3; trachoma, 2; paralysis, 2; diabetes, 2, and one each of relapsing fever, plague, angina pectoris, progressive muscular atrophy, syphilis (a surgeon infected during an operation), apoplexy, sunstroke, anæmia. Total, 174.

The diseases named in Tables 73 and 74 refer only to those contracted in China. Besides these, 162 were named as contracted at home, as follows: Scarlet fever, 39; typhoid, 37; pneumonia, 20; appendicitis, 16; nervous breakdown, 13; malaria, 12; diphtheria, 10; tuberculosis, 4; smallpox, 3; heart disease, 2; influenza, 2, and one each of kidney disease, meningitis, dysentery, and sprue.

So few of the correspondents put down their ages, that a general comparison of morbidity in China and at home on the basis of years of residence is impossible.

Table 75 shows the number and proportion of Church Missionary Society missionaries, as reported by Price,[27] invalided home from the sections of China. Neurasthenia (nervous breakdown) is by far the most common cause. Contrary to statistics of this study, it is much more frequent in North China.

**Table 75** CAUSES OF INVALIDING OF 203 CHURCH MISSIONARY SOCIETY MISSIONARIES.

| SICKNESS | North China | Central China | South China | All China |
|---|---|---|---|---|
| | PER CENT | PER CENT | PER CENT | PER CENT |
| Neurasthenia | 44.3 | 17.7 | 16.6 | 25. |
| Insanity | 5.1 | 12.6 | 7.5 | 8.8 |
| Typhoid Fever | 13.8 | 7.6 | 7.5 | 9.8 |
| Malaria | 8.6 | 11.1 | 15. | 11.8 |
| Dysentery | 5.1 | 7.6 | 3. | 5.9 |
| Tuberculosis | 5.1 | 8.8 | 18. | 10.8 |
| Typhus Fever | ---- | 5. | ---- | 1.9 |
| Sprue | ---- | 2.5 | 4.5 | 2.9 |
| Smallpox | ---- | 3.8 | ---- | 1.4 |
| Anemia | ---- | ---- | 3. | .9 |
| Number of Cases Invalided | 58. | 79. | 66. | 203. |

### PERIOD WHEN SICKNESSES ARE CONTRACTED

The attempt is made in Table 76 to ascertain the danger period for various diseases.

The date of infection had to be calculated from the age of the person, the age at time of infection and number of years in China. This roundabout method gives opportunity for error. Also the number of cases in which the necessary data was given is small. Second or subsequent attacks are included. The numbers should be compared with the bottom line, which gives the number of missionaries who have spent the specified year in China. Few questionnaires reached those who had been less than a year in China.

**Table 76** MARRIED MISSIONARIES—NUMBER OF YEARS AFTER ARRIVING IN CHINA WHEN SICKNESSES WERE CONTRACTED.

| SICKNESS | Number of Sicknesses in Specified Year After Arrival | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-1 | 1 | 2 | 3 | 4 | 5-9 | 10-14 | 15-19 | 20-24 | 25- | All Years |
| Dysentery | 22 | 22 | 20 | 11 | 9 | 32 | 14 | 3 | ------ | 1 | 134 |
| Typhoid Fever | 17 | 7 | ------ | 5 | 2 | 20 | 8 | 5 | 2 | ------ | 66 |
| Malaria | 27 | 16 | 15 | 11 | 10 | 31 | 16 | 2 | 1 | ------ | 129 |
| Smallpox | 8 | 4 | 4 | 1 | 1 | 1 | ------ | ------ | 1 | ------ | 20 |
| Typhus Fever | ------ | 2 | 3 | ------ | 2 | 6 | 5 | 2 | ------ | ------ | 20 |
| Nervous Breakdown | 5 | 4 | 3 | 3 | 9 | 5 | 3 | 1 | 1 | ------ | 34 |
| Sprue | 1 | 2 | 2 | ------ | 3 | 6 | 5 | 2 | ------ | ------ | 21 |
| Total | 80 | 57 | 47 | 31 | 36 | 101 | 51 | 15 | 5 | 1 | 404 |
| Number of Missionaries | ------ | 1278 | 1229 | 1159 | 1074 | 1005 | 627 | 367 | 211 | 81 | ------ |

Smallpox is definitely more common immediately after arrival in China. Other infections show the same thing in less marked degree. Only 54% of the sicknesses named were contracted after three years in China, though 84% of the missionaries have been in China more than that length of time.

This decreasing morbidity may be due either to increasing immunity to disease, or to increasing knowledge and care in prevention. It should be noted, however, that long residence does not confer immunity. Infections are common after the fifth year.

Of the typhoid cases, 36% occurred in the first three years on the field. Among British missionaries[27] from all mission fields, of 187 cases of typhoid, about half occurred during the first three years and 70% during the first six years.

## PROPORTION WITHOUT SERIOUS SICKNESS

**Table 77** PERCENTAGE OF HUSBANDS AND WIVES WHO HAVE NOT HAD ANY IMPORTANT SICKNESS WHILE LIVING IN CHINA.

| PROVINCE | Number Returning Question Blanks | | Per Cent Who Answered Question Concerning Personal Health | | Of Those Answering, Per Cent Who Had Not Been Seriously Sick | |
|---|---|---|---|---|---|---|
| | Husband | Wife | Husband | Wife | Husband | Wife |
| Manchuria | 26 | 26 | 65 | 61 | 65 | 56 |
| Shantung | 95 | 97 | 65 | 67 | 52 | 50 |
| Chihli | 107 | 109 | 72 | 71 | 61 | 55 |
| Shansi | 55 | 57 | 72 | 74 | 50 | 52 |
| Shensi | 26 | 26 | 58 | 58 | 60 | 66 |
| Kansu | 26 | 26 | 70 | 70 | 33 | 55 |
| **North China** | 335 | 341 | 70 | 70 | 55 | 54 |
| Kiangsu | 158 | 160 | 64 | 66 | 45 | 45 |
| Anhwei | 30 | 28 | 53 | 60 | 44 | 47 |
| Chekiang | 73 | 74 | 56 | 56 | 21 | 33 |
| Honan | 83 | 84 | 64 | 67 | 60 | 51 |
| Kiangsi | 32 | 31 | 56 | 53 | 28 | 5 |
| Hupeh | 65 | 70 | 63 | 64 | 24 | 44 |
| Hunan | 74 | 74 | 68 | 68 | 35 | 33 |
| Kueichow | 9 | 9 | 88 | 88 | 50 | 50 |
| Szechuan | 112 | 113 | 66 | 66 | 65 | 58 |
| **Central China** | 636 | 643 | 63 | 65 | 44 | 44 |
| Fukien | 75 | 76 | 72 | 72 | 47 | 43 |
| Kwangtung-Kwangsi | 123 | 126 | 67 | 66 | 48 | 48 |
| Yunnan | 9 | 9 | 55 | 55 | 40 | ---- |
| **South China** | 212 | 211 | 68 | 68 | 47 | 45 |
| **All China** | 1183 | 1171 | 65 | 68 | 47 | 47 |

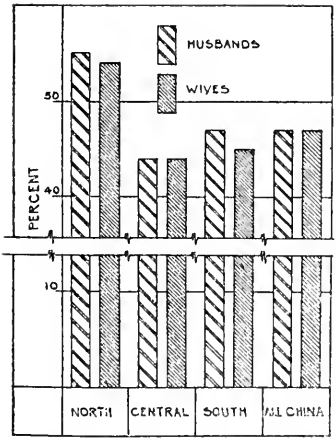


**Figure 40.** Percentage of married missionaries who have not had serious sicknesses while living in China, by sections. (Illustrating Table 77.)

We have seen that sickness among adults is more frequent in Central and South China than in North China. This tabulation included some minor ailments. Also some of the persons had had several different diseases.

Table 77 shows what proportion of adults have not been seriously ill in China. Slightly more than half (53%) of those who answered had had a serious disease (round and tape worms, dengue, and trachoma, etc., not counted). Central and South China show a larger proportion of *persons* who have been sick than does North China, just as (Table 74) these sections show a larger proportion of *sicknesses.*

## PAST GENERAL HEALTH
### GEOGRAPHICAL LOCATION

**Table 78** PAST GENERAL HEALTH OF HUSBAND AND WIFE —BY PROVINCES.

| PROVINCE | HUSBAND | | | | | WIFE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. Reporting | Percentage Reporting Past General Health As | | | | No. Reporting | Percentage Reporting Past General Health As | | | |
| | | Poor | Fair | Good | Robust | | Poor | Fair | Good | Robust |
| Manchuria | 17 | ---- | 6 | 76 | 18 | 17 | 6 | 29 | 53 | 12 |
| Shantung | 57 | 2 | 12 | 51 | 35 | 58 | 3 | 24 | 60 | 12 |
| Chihli | 80 | 1 | 4 | 50 | 44 | 78 | 1 | 14 | 54 | 31 |
| Shansi | 42 | ---- | 19 | 62 | 19 | 41 | ---- | 12 | 71 | 17 |
| Shensi | 18 | ---- | 2 | 48 | 50 | 19 | ---- | 32 | 52 | 16 |
| Kansu | 19 | ---- | 21 | 47 | 31 | 19 | ---- | 26 | 53 | 21 |
| **North China** | 233 | 1 | 11 | 55 | 33 | 132 | 1 | 20 | 59 | 20 |
| Kiangsu | 99 | 1 | 9 | 58 | 31 | 100 | 3 | 15 | 59 | 23 |
| Anhwei | 17 | ---- | ---- | 76 | 24 | 16 | ---- | 25 | 50 | 25 |
| Honan | 52 | ---- | 6 | 62 | 31 | 50 | ---- | 22 | 50 | 28 |
| Chekiang | 36 | ---- | 8 | 58 | 33 | 38 | 3 | 19 | 57 | 21 |
| Kiangsi | 16 | ---- | 25 | 56 | 18 | 17 | ---- | 23 | 59 | 18 |
| Hupeh | 44 | ---- | 7 | 50 | 43 | 46 | 2 | 17 | 59 | 22 |
| Hunan | 49 | ---- | 14 | 59 | 27 | 49 | 4 | 37 | 49 | 10 |
| Kueichow | 8 | ---- | ---- | 88 | 12 | 7 | ---- | 57 | 43 | ---- |
| Szechuan | 78 | 1 | 13 | 54 | 32 | 79 | 1 | 20 | 54 | 24 |
| **Cent. China** | 399 | 2 | 9 | 62 | 28 | 402 | 1 | 26 | 51 | 19 |
| Fukien | 56 | ---- | 9 | 63 | 28 | 57 | 2 | 21 | 60 | 17 |
| Kwangtung | 80 | 2 | 13 | 61 | 24 | 79 | 4 | 32 | 48 | 16 |
| Yunnan | 5 | ---- | 20 | 80 | ---- | 5 | ---- | 20 | 60 | 20 |
| **South China** | 141 | 1 | 14 | 68 | 17 | 141 | 3 | 24 | 56 | 18 |
| **All China** | 773 | 1 | 11 | 58 | 30 | 775 | 3 | 23 | 54 | 20 |
| Husband & Wife | 1548 | 2 | 17 | 56 | 25 | ---- | ---- | ---- | ---- | ---- |

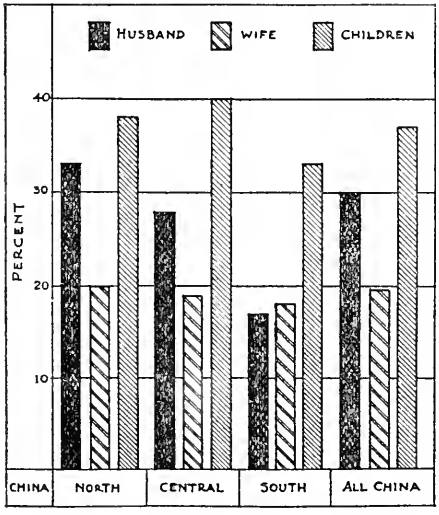


Figure 41. Percentage of husbands, wives, and children whose past general health has been robust, by sections. (From Tables 78 and 61.)

Table 78 and Figure 41 show the past general health of husband and wife by provinces. The wives in various sections differ but little. Husbands are considerably above their wives in North China, and for all China show 50% more who have been in robust health (30% against 20%). This in spite of the fact that men have a higher morbidity rate than women. Evidently the general conditions of work, and of child bearing (normal confinements are not counted as sicknesses) are important causes of ill health for women. Only

25% of the missionaries consider that their health has been robust. Does this fact bear any relation to the progress of the church in China?

Report made in 1913 by British societies[27] showed that twice as many women as men were invalided home from Central and South China.

## MISSIONARY SOCIETIES

**Table 79** PAST GENERAL HEALTH OF HUSBAND AND WIFE BY SOCIETIES

| | HUSBAND | | | | | WIFE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. Reporting | Percentage Reporting Past General Health As | | | | No. Reporting | Percentage Reporting Past General Health As | | | |
| | | Poor | Fair | Good | Robust | | Poor | Fair | Good | Robust |
| Y. M. C. A. | 39 | 5 | 8 | 46 | 41 | 37 | 3 | 5 | 59 | 33 |
| London Miss. Soc. | 25 | ---- | 8 | 60 | 32 | 24 | 23 | ---- | 42 | 33 |
| Other English Societies | 86 | 1 | 8 | 53 | 38 | 91 | 1 | 31 | 45 | 23 |
| American Baptist, North | 31 | ---- | 12 | 55 | 32 | 31 | 3 | 24 | 49 | 24 |
| American Board | 31 | ---- | 6 | 58 | 35 | 30 | ---- | 16 | 64 | 20 |
| Am. Methodist, North | 48 | ---- | 2 | 61 | 37 | 47 | 4 | 22 | 57 | 17 |
| Canadian Methodist | 33 | 3 | 22 | 51 | 24 | 33 | ---- | 10 | 60 | 30 |
| American Presbyterian, North | 72 | 1 | 8 | 56 | 35 | 72 | 2 | 18 | 62 | 18 |
| Church Miss. Soc. | 24 | ---- | 12 | 63 | 25 | 28 | 4 | 25 | 46 | 25 |
| Other American Societies | 139 | 1 | 11 | 58 | 30 | 143 | 3 | 23 | 57 | 17 |
| American Church Mission | 21 | ---- | 9 | 62 | 29 | 23 | ---- | 17 | 65 | 17 |
| Southern Baptist | 31 | ---- | 12 | 63 | 25 | 32 | 6 | 19 | 56 | 19 |
| China Inland Mission | 96 | ---- | 9 | 68 | 23 | 93 | 1 | 26 | 53 | 20 |
| German Societies | 10 | ---- | 30 | 50 | 20 | 9 | ---- | 22 | 55 | 22 |
| Scandinavian Societies | 50 | 2 | 12 | 64 | 22 | 50 | ---- | 38 | 54 | 8 |
| **All Societies** | 736 | 1 | 10 | 58 | 31 | 743 | 2 | 21 | 55 | 20 |
| **All Societies**—Husband and Wife | 1479 | 1 | 15 | 57 | 26 | ---- | ---- | ---- | ---- | ---- |

Table 79 gives the condition of health by societies, those reporting the highest percentage with robust health being placed at the top. The order, in general, is similar to that found in the tables showing mortality of children. It is reasonable to suppose that both parents and children suffer from the conditions which cause ill health.

## PART III—Some Factors in Prevention of Disease

### THE PREVENTABLE DISEASES

The largest results in life-saving come from concentration of effort on the diseases which are causing the greatest loss and which are most easily prevented. The degree of preventability is a most important factor.

The ratio of preventability of death for various diseases has been worked out by Professor Irving Fisher[5] of Yale. Some of those of most importance in China are: Prematurity, 40; scarlet fever, 50; diarrhœa and enteritis, 60; dysentery, 80; diphtheria, 70; typhoid fever, 85; malaria, 80; smallpox, 75; broncho-pneumonia, 50; meningitis, 70; tuberculosis, 75. This percentage of the present number of deaths could be prevented if "the knowledge now existing among well-informed men in the medical profession were actually applied in a reasonable way and to a reasonable extent."

If these preventive measures could have been applied in China, 200 of the 300 children in this study who have died of these above-named diseases could have been saved. Though many of these preventive measures cannot be applied in China, much can be done. Three-fourths of the deaths of children in China are due to infectious diseases. This is the easiest class of disease to prevent.

English statisticians[28] find that because of the reduction in death rates which took place in that country between the years 1871-80 and 1910-12, the English people have gained 9,612,600 additional years of life. If lives of missionaries could be saved in the same ratio, probably the saving in years would be equivalent in the next three or four decades to a doubling of the missionary force.

#### DYSENTERY

This is the most widespread and destructive of the diseases attacking missionaries in China. In this study, 808 cases are recorded, with 84 deaths. For the total missionary body, at the same rate, the cases would number over 2,000, and the deaths over 200. The analysis of statistics concerning children shows that it is less sensitive than other infections to medical training on the part of parents, and deaths from dysentery have not decreased in recent years as they have for other infectious diseases. Yet the disease comes only through the victim himself, or his nurse, putting the live germs into his mouth. Hundreds of thousands of dollars' worth of time and lives could be saved in a few years if missionaries knew

and applied the proper preventive measures. These measures imply the possession of kitchens which can be kept clean, and the means for properly sterilizing food and drink.

### TYPHOID FEVER

If the death rate from typhoid for adults were known, it would be a much larger item than it is for children, since adults are more susceptible. Unlike dysentery, we have in preventive inoculation an invaluable weapon for fighting the disease.

The morbidity from typhoid in the missionary army in China and in the United States[29] army is compared in Table 80.

**Table 80** SICKNESS FROM TYPHOID FEVER AMONG MARRIED MISSIONARIES AND UNITED STATES SOLDIERS

| | Cases of Typhoid per 1,000 Years of Service |
|---|---|
| U. S. Army, 1900-1908 (before compulsory inoculation) | 5.65 |
| U. S. Army, 1912-1918 (after compulsory inoculation) | .23 |
| Married Missionaries (before 1919) | 7.69 |

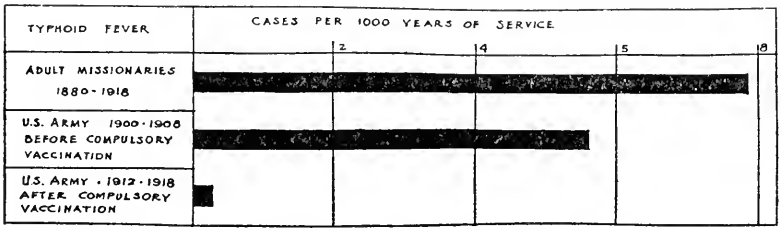


Figure 42. Sickness from typhoid fever among married missionaries and United States soldiers. (Illustrating Table 80.)

Figure 42 shows how the rate has been lowered in the United States army following the compulsory use of typhoid —paratyphoid inoculations.

If typhoid inoculation, together with reasonable care of food and drink, were used by all missionaries, the morbidity rate from typhoid could be reduced to the point reached by the army. In this event, using the values worked out by G. C. Whipple,[30] that each death from typhoid represents a loss of $6,000 (*i.e.*, $4,634 for each person dying and $1,366 through disability for those cases that did not die), and assuming that during the next decade on the field the missionary force in China will average 7,500 adults, the amount of money saved to the societies in that time would be $336,000. If we consider the trained missionary worker of several times' greater value than the average person of the United States is to his community, this amount should be multiplied several times.

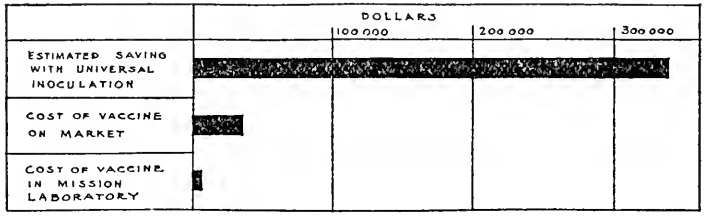


Figure 43. Amount of money which would be saved in ten years on the field with typhoid fever rate reduced to that of United States Army.

The above figure is arrived at in the following way: 127 cases of typhoid are reported as occurring during the 17,600 years spent in China, or 7.69 cases per 1,000 years. If the rate were reduced to .23, 7.46 cases per 1,000 years would be saved. In 75,000 years this would amount to 560 cases. Among British missionaries[27] in all fields it was found that 29% of the cases of typhoid resulted fatally. Suppose, however, that only 10% die, 56 lives would be saved. At $6,000 this would amount to $336,000. In this tabulation the estimated number of adults on the field is less than the number used in a previous article.[25]

The cost of vaccine would be but a small fraction of the amount saved, and probably 90% of this in turn could be saved if vaccine were produced in the laboratories of a missionary medical school and sent in bulk to all mission stations.

Wide-awake missionaries and mission boards recognize the value of this method of insurance against typhoid. Yet a census of newly arrived missionaries in the Peking Union Language School in 1920 showed that 20% had been sent to China without this protection.

A word of warning concerning inoculation is needed:

"The triple typhoid inoculation confers a high degree of protection against typhoid and paratyphoid fevers, but it does not give absolute protection against massive infection with the causitive organisms . . . it does not warrant neglect of the other well-known sanitary precautions against the disease." (U. S. War Department—Regulations No. 28. March 11, 1919).[31]

Among adults, 127 cases of typhoid fever developed in China, and 37 cases outside; 77% of the cases, therefore, occurred in China. The persons have spent an average of 11 years in China, which is not more than a third of their lifetime. The chances of the missionary getting typhoid has been, therefore, about 12 times as great in China as at home.

### SMALLPOX

Most of the cases of typhoid fever occurred before typhoid inoculation had been introduced. All the cases of smallpox, on the other hand, occurred more than a hundred years after Jenner demonstrated to the world that, except

in rare instances, vaccination will protect from smallpox. In this study, 111 cases of smallpox, with 28 deaths, are reported among adults and children. For the whole missionary body in China this would mean a total of about 260 cases, with 55 deaths.

**Table 81** MORTALITY FROM SMALLPOX AMONG MISSIONARY FAMILIES (ADULTS AND CHILDREN) AND AMONG GENERAL POPULATION IN ENGLAND AND THE UNITED STATES

| | Number of Deaths from Smallpox |
|---|---|
| Per 100,000 inhabitants in England and Wales,[21] 1893-1902 | 2.1 |
| England and Wales, 1903-1917 | .29 |
| United States Registration Area, 1904-1908[32] | .72 |
| Per 100,000 years Spent in China by Missionaries | 68.5 |

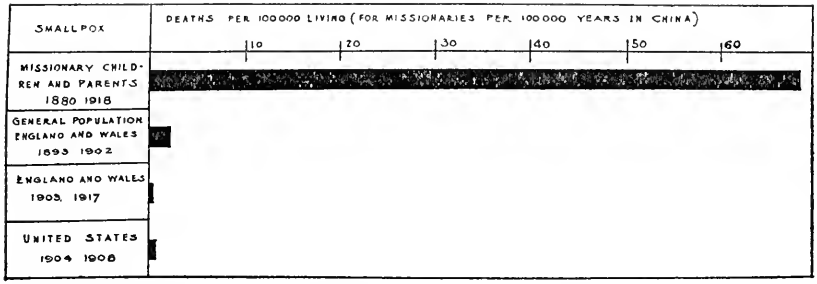


Figure 44. Mortality from smallpox in missionary families and in England and the United States. (Illustrating Table 81.)

Table 81 and Figure 44 show the relative mortality among missionaries' families in China and the general population of the United States and England for closely corresponding periods.

It has been pointed out, already, that most of the loss from smallpox has been borne by three groups of societies.

Among adults, 28 cases of smallpox are reported from China and 3 from outside; 90%, therefore, were contracted in China—during only one-third the life-time. The likelihood of the missionary getting smallpox has been about 30 times as great in China as at home.

One missionary writes: "Of 26 missionaries of one board who have come to this district, 12 have been attacked by smallpox." The high incidence of smallpox immediately raises an important question. How many of these cases were contracted in spite of the person having been vaccinated?

To determine this point, the writer sent a question blank to 50 families, which had reported cases of smallpox. In answer, 30 families reported 51 cases of smallpox, 37 of which were not fatal and 14 fatal. The answers are summarized in Table 82:

**Table 82** CASES OF SMALLPOX, WITH REFERENCE TO PREVIOUS VACCINATIONS

| Number of Successful Vaccinations | ATTACK FATAL | | | | ATTACK NOT FATAL | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AGE AT ATTACK | | | | AGE AT ATTACK | | | | |
| | 0-1 Year | 1-4 Years | 5-19 Years | 20 Plus Years | 0-1 Year | 1-4 Years | 5-19 Years | 20 Plus Years | Not Stated |
| None | 8 | 1 | ------ | 5 | 2 | 11 | 2 | 3 | 3 |
| One | 1 | ------ | ------ | ------ | 1 | 3 | 2 | 6 | ---- |
| Two | ------ | ------ | ------ | ------ | ---- | ---- | ---- | 3 | ---- |
| Three | ------ | ------ | ------ | ------ | ---- | ---- | ---- | 1 | ---- |
| **Total** | 9 | 1 | ------ | 5 | 3 | 14 | 4 | 13 | 3 |

Seventeen of the persons had been vaccinated, 35 had not been. In 12 of the 14 fatal cases vaccination had not been attempted. One other (a baby of eight months) had had an unsuccessful vaccination three months before. Out of the 14 cases, there is record of only one case dying from smallpox after being successfully vaccinated. In this case (a seven-months-old baby) the vaccination had been done three weeks previously. Of these 14 fatal cass, eight were among infants, and five among adults.

Of the 37 cases which did not end in death, 21 had not been successfully vaccinated. Of the 21, in seven cases vaccination had been attempted, but had not "taken." Sixteen cases had had successful "takes." Of these twelve had had one "take;" three, two "takes;" and one had had three "takes."

In these cases it is important to know how long a time had elapsed between vaccination and contraction of the disease. In those who had had one "take," the interval was in one case only a few days (a child exposed when the mother developed smallpox). In three cases the interval was a year; in one case, four years; three cases, between five and fifteen years, and in four cases, more than fifteen years.

Of the three cases which had had two "takes," the interval in one case was one year, and in two cases, ten to fourteen years. Only one case developed after three "takes." Here the last "take" was but a few days before. (Vaccination done just before the disease breaks out will not protect.)

Eight cases of smallpox occurred less than five years after vaccination. Two of these were only a few days after, so that immunity had not had time to become established.

One would expect the six other cases to be protected. Three of these cases were in one family. Vaccination had been done fifteen months before, and all three had large scars to show for it. Of 17 cases, then, which followed successful vaccination, six were within a period in which the individual should have been immune.

The information collected, though meagre, serves to emphasize the importance of vaccination. Every death, with the exception of one, came in unvaccinated persons. The non-fatal cases which occurred in vaccinated individuals would indicate that vaccinations should be repeated at shorter intervals in China than in countries where smallpox has been almost eradicated.

Several of the reports blamed the vaccine used for untoward results—eczema, epilepsy, even smallpox itself. Though the vaccine was not to blame, arrangements should be made so that the missionary body may be sure of a pure, fresh supply.

Eight cases developed smallpox after failure to get a "take." In one case—a baby—the attempt had been made three times, the last one but three months before the attack. This points to the need of repeated attempts at vaccination. The writer knows of a successful vaccination of a baby after fourteen unsuccessful attempts.

It is of interest to look at larger figures on this subject collected in the United States. Among 134,669 vaccinated persons exposed to smallpox, 619, or .46%, contracted the disease, of whom 13, or 4.2%, died. Among 147,941 *unvaccinated* and exposed persons, on the other hand, 4,056, or 2.7%, became sick, of whom 282, or 12.6%, died. That is, the sickness rate among unvaccinated is six times what it is in the vaccinated, and the death rate three times as great, or the chances of dying of smallpox are 18 in the unvaccinated to 1 in the vaccinated.[33] In another investigation in New York City[34] of 534 vaccinated persons who were exposed to smallpox, none became sick, while of 7,567 unvaccinated persons, 161, or 2%, contracted smallpox.

These three diseases have been mentioned because they are most destructive (dysentery), or have a specific means of prevention (smallpox and typhoid). The evidence concerning other diseases (e.g., malaria, scarlet fever, diphtheria) might be analyzed with profit.

## CAUSES OF INFECTION

Correspondents were asked to state, whenever possible, the cause of the sicknesses. A great variety of factors were

named. Lack of medical attention was mentioned 37 times, usually in cases which resulted fatally. Inexperienced medical attention was blamed five times. Contaminated food, milk, water, unscreened houses, ignorant servants, boat travel (9 cases of dysentery, with 2 deaths, among 18 passengers on one trip of a Yangtse river boat), privation, poor houses, flies, over-medication, epidemics among Chinese, etc., were named from one to many times.

## METHODS OF DISEASE PREVENTION

One hundred and eighty-six of those who filled out the questionnaire (about 14%) gave advice on the subject of maintenance of health. The various points named are listed in the following table. The figures refer to the number of correspondents who mentioned the subject.

Table 83 ADVICE CONCERNING HEALTH GIVEN BY MISSIONARIES

| | |
|---|---|
| *Relating to Mission Boards:* | |
| Institute comprehensive health survey | 1 |
| Provide thorough physical examination of candidates | 1 |
| Provide medical examiners conversant with conditions on the field | 1 |
| Provide medical instruction to candidates | 1 |
| Provide information concerning conditions on the field | 1 |
| Provide more medical attention on the field | 1 |
| Provide professional and nursing care for women at childbirth | 2 |
| Have a rule that women be on the field for a year before marriage | 1 |
| Increase the salaries | 2 |
| Have a shorter time between furloughs | 2 |
| Build better residences | 1 |
| Provide houses at summer resorts | 1 |
| Supervise the schools for children | 1 |
| *Relating to Stations:* | |
| Display real Christian spirit | 1 |
| In assignments, consider compatibility of dispositions | 1 |
| Each family should board separately | 1 |
| *Relating to Housing:* | |
| Arrange in large compound | 2 |
| Have modern-style houses | 6 |
| Have Chinese-style houses | 1 |
| Sanitary plumbing, etc. | 4 |
| Proper screening | 26 |
| At a distance from the street | 3 |
| Drain neighboring pools | 2 |
| Have self-closing servants' closet | 1 |
| Have separate kitchen for servants | 1 |
| *Relating to Missionary Doctors and Nurses:* | |
| Give more careful attention to foreign patients | 3 |
| Advise early smallpox vaccination | 4 |
| Warn community of sickness | 1 |
| Give better prenatal care to missionary wives | 1 |
| Examine wives after illness | 1 |
| Maintain stricter quarantine | 1 |
| Give furlough for sickness before death is imminent | 1 |

*Relating to Vacations and Travel:*

| | |
|---|---|
| Go to summer resort | 22 |
| Don't go to summer resort | 2 |
| Avoid summer travel | 1 |
| Take extra care in traveling | 2 |
| Don't travel third class | 1 |
| Be careful of food on river steamers | 2 |

*Relating to the Family—General Points:*

| | |
|---|---|
| Study elements of medicine before coming | 8 |
| Don't worry | 1 |
| Get to feeling at home | 2 |
| Maintain a confident attitude | 2 |
| Acquire common sense | 1 |
| Keep regular hours | 1 |
| Daily exercise and recreation | 13 |
| Daily bath | 1 |
| Go to bed with clean mouth | 1 |
| Expectorate after bad smells | 1 |
| Don't worry about germs | 3 |
| In sickness, trust the Lord | 2 |
| Live as the Chinese do | 1 |
| A little private income important | 1 |
| Rest after tiffin | 1 |
| Take life easy at first | 1 |
| Listen to advice of older missionaries | 1 |
| Older missionaries should advise | 1 |
| Have a family game before bed-time | 1 |
| Have proper bowel habits | 1 |
| Have comfortable beds | 1 |
| Carry mosquito essence | 1 |
| Control flies | 2 |
| Have regular medical examination | 1 |
| Take typhoid and paratyphoid vaccination | 2 |
| In cold weather wear nightcaps | 1 |

*Relating to Parents:*

| | |
|---|---|
| Avoid children too often | 4 |
| Have a small family | 1 |
| Avoid early child-bearing on the field | 3 |
| Learn duty of refusing to do good at family expense | 1 |

*Relating to the Mother:*

| | |
|---|---|
| No language study during pregnancy | 1 |
| Learn the language | 1 |
| Get "Holt" | 1 |
| Exercise extra care during pregnancy | 3 |
| Avoid cart travel when pregnant | 3 |
| Stay in bed a month following childbirth | 1 |
| Give less time to mission work and more to children | 1 |

*Relating to Housekeeping:*

| | |
|---|---|
| Learn how to cook | 1 |
| Be a good housekeeper | 4 |
| Personally supervise the kitchen | 4 |
| Provide more proteids in diet | 2 |
| Provide more fats | 1 |
| Eat fresh bread (to avoid sprue) | 1 |
| Scald and then bake bread bought on the street | 1 |
| Scald fruit | 1 |
| Use only boiled water | 24 |
| Use only boiled milk | 12 |
| Use only cooked vegetables | 4 |

*Relating to the Care of Children:*

| | |
|---|---|
| Personal supervision of children by the mother | 20 |
| Personally prepare babies' food | 5 |
| Personally feed children | 5 |
| Use care in preparing food | 1 |
| Serve plain food | 5 |
| Cow's milk important | 3 |
| Keep your own cow | 1 |
| Use goat's milk | 1 |
| See that the milk is not watered | 3 |
| Use tinned milk | 1 |
| Use wet nurse if mother's milk fails | 2 |
| Let children eat only at table | 4 |
| Don't allow them to eat servants' food | 1 |
| Don't allow them to eat Chinese food | 3 |
| Don't allow them to eat Chinese candy | 1 |
| Serve only cooked foods | 1 |
| Serve plenty of fruits | 2 |
| Send children home between 5 and 10 years | 4 |
| Send children home between 10 and 15 years | 2 |
| Send children home between 15 and 20 years | 2 |
| Keep children's fingers out of the mouth | 2 |
| Boil bath water | 1 |
| Have daily mouth gargling | 1 |

*Relating to Children's Sleep and Play:*

| | |
|---|---|
| Follow usual normal life | 4 |
| Provide exercise | 2 |
| Lead outdoor life | 3 |
| Don't let the baby creep on the floor | 2 |
| Don't allow children to play in pools | 1 |
| Guard against loneliness (in isolated stations) | 1 |
| Put to bed by mother (to prevent bad habits) | 1 |
| Put to bed early | 1 |
| Provide mosquito nettings | 4 |
| Open windows | 3 |
| Sleep outdoors | 2 |
| Use mosquito lamp | 1 |
| Keep inside after sundown in winter | 1 |

*Relating to Clothing:*

| | |
|---|---|
| Dress warmly in winter | 2 |
| Wear cholera belt | 3 |
| Protect from sun | 5 |
| Use sun hats | 4 |
| Provide stout shoes | 1 |
| Don't allow the children to go barefooted on ground | 1 |

*Relating to Medical Attention:*

| | |
|---|---|
| Watch stools | 1 |
| Demand daily bowel movement | 2 |
| Provide glasses if necessary | 2 |
| Give periodic quinine | 2 |
| Don't give too much quinine | 1 |
| Give periodic santonine | 1 |
| Have semi-annual examination for worm eggs | 1 |
| Use prompt dieting on diarrhœa | 1 |
| Have circumcised | 1 |
| Early smallpox vaccination | 1 |

*Relating to Relations with Chinese:*

| | |
|---|---|
| Keep from Chinese visitors | 1 |
| Keep from Chinese children | 2 |
| Allow to play with Chinese children | 1 |

| | |
|---|---|
| Servants— | |
| The fewer the safer | 1 |
| Instruct servants | 6 |
| Watch servants | 2 |
| Keep children from servants | 3 |
| Keep children from other people's servants | 1 |
| Have servants examined by doctor | 1 |
| Watch for tuberculosis | 4 |
| Watch for dysentery | 1 |
| Watch for malaria | 1 |
| Watch for syphilis | 1 |
| Watch for trachoma | 2 |
| *Relating to Amah:* | |
| Have none | 3 |
| Select with care | 1 |
| Don't change often | 1 |
| Require to bathe regularly | 1 |
| Provide with clean garments | 1 |
| Watch for teaching immoral practices | 1 |
| *Relating to Schools:* | |
| They are not properly heated | 2 |
| Exercise and play neglected | 1 |
| Children from south should go north | 1 |
| *Health in China and at Home:* | |
| Chance for health in China— | |
| Better than in homeland | 3 |
| As good as in homeland (if certain precautions are taken) | 29 |
| Worse than in homeland | 18 |

Many of the collaborators in this study wrote feelingly on certain phases of this subject. There is not space to reproduce these letters, but some of the more striking sentences are set down.

"Health of children not so good in China? Rubbish."

"Some missionaries would be happier if they knew more about the interior of China and less about the interior of themselves."

"'Trust in the Lord and do good—so shalt thou dwell in the land.'"

"'Take cheerfully the spoiling of your goods.'"

"Don't let your people send you funeral orations by every mail."

"The excessive care necessary makes the children selfish and self-absorbed."

"During the nursing months I live more nearly the life expected of a good cow."

"A properly trained, trustworthy, Christian amah is better than a mother."

"I (reared in China) know that some missionary children are allowed to learn vileness from bad servants. No mother ought to be so absorbed in the souls of the Chinese that she lets the devil get the bodies of her children."

"Health is largely up to the housekeeper."

"It ought to be language first then babies, or babies first then language, but certainly not both at the same time."

"Don't let young missionaries presume on God's almightiness to nullify rashness."

"The worm (round) that dieth not."

"Our doctors pay no attention to prenatal examinations."

"At home, the people who have the best doctors money can engage do not get the good attention I have had on the field, because these best doctors are so busy."

"Microscopes are time consumers, but life preservers."

"Have a physical examination once a year by a physician that will do a good job of it and take some time to it."

"Get a 'fool-proof' closet stool cover; keep the place whitewashed and clean-looking, so they (the servants) will be proud of it. Put a self-closing screen door on it in summer and hang a fly-swatter in it and encourage its use."

"In one sample of cow's milk there was 75% of water."

"Wanted, a 'Holt,' adapted for feeding in China."

"Put play into your schedule as religiously as you put work or Bible study."

(From a physician): "I would keep every pregnant and every nursing woman from language study. No one will believe in the necessity of such regulations unless she first transgresses them, and then the fat is in the fire."

"One cannot expect the children of mothers to be well when the mothers . . . permit the ignorant and dirty Chinese to feed and care for the children's wants."

(From a physician): "When children do get sick they get much inferior care, on the whole, than they would get at home. Everybody is so busy making statistics that foreign patients do not count. All appear to be affected with the Bacillo coccus statistinitis. Quantity instead of quality is the watchword."

## THE RESPONSIBLE AGENCIES

*Considering all the difficult circumstances of the past,* missionaries and mission boards have doubtless done the best possible for the health of the workers. Mortality rates are doubtless pigmy sized in comparison with the huge physical difficulties faced. However, in the light of important new medical knowledge, in the light of the present tremendous urgency for the missionary program, in the light of freshly opened reservoirs of funds, in the light of growing unity among Christian forces,—the health record for the past will not do for the future. The problem of the health of the workers needs to be handled in a new and bigger way.

The purpose of this study is to set forth the facts concerning the health of a certain portion of the missionary force in China. It does not aim to present a detailed health program. That can be done only by the mission boards.

This study would be incomplete, however, if the agencies concerned in the safeguarding of health were not indicated.

1. *The Individual Missionary.* Most of the 161 items of Table 83 are concerned with the precautions which the individual should follow. In a country where one must be his own board of health such individual measures are most essential.

2. *Missionary Doctors.* Doctors are supposed to bear the same relation to the missionary body that the medical corps of the army bears to the force in the field, but they cannot fully live up to that relationship without either large reinforcements, or a decrease in their work for the Chinese.

3. *Groups on the Field.* United efforts by mission stations, the China Medical Missionary Association, union language schools, and other union organizations can assist greatly in making health measures effective. An encouraging feature is the coming of the China Medical Board. With the opening of the Peking Union Medical College hospital, missionaries in China have at their disposal the advice of specialists who are supplied with all the up-to-date equipment for the diagnosis and treatment of disease.

4. *The Individual Missionary Boards.* In such matters as the securing and dissemination of accurate information concerning sickness on the field, the best methods of disease prevention, in the matter of salaries, housing, period of service, schools for children, etc., the responsibility rests not with the missionaries, but with the boards for which they work.

The China Medical Missionary Association at its last conference held at Peking, in February, 1920, after considering some of the facts of this study, unanimously passed the following resolutions:

Whereas, the health of the individual missionary and his family is essential to the success of the missionary enterprise, and,

Whereas, the war has demonstrated the possibility of greatly reducing disease among the forces in the field through the use of modern methods of prevention and cure; and,

Whereas, preventable sickness and death constitutes a continuing drain on the Christian forces in China; therefore,

Resolved, that the China Medical Missionary Association should and hereby does call the attention of the missionary boards doing work in China to the need of an energetic, comprehensive, co-operative program, looking toward the physical well-being of the workers in the field. Among other items, such a program should include:

"First, the tabulation by the boards of their health statistics for the past, and where the records are inadequate, the installation of a system of vital bookkeeping by means of which they and the doctors on the field may be in possession of the basic facts necessary for intelligent action.

"Second, a thorough physical examination of candidates, with a greater degree of co-operation between examining physicians at home and physicians on the field.

"Third, the more complete instruction of missionaries in the best means of guarding against disease in the section of the country in which they are to work.

"Fourth, the securing for the missionaries of all the up-to-date means for the prevention of disease, such as yearly physical examinations, regular vaccination against typhoid, paratyphoid, and smallpox, proper housing, screening, etc."

The China Medical Missionary Association especially offers its support in the planning and in the execution of any such forward looking program, and it hereby directs its executive committee to lay this matter before the missionary boards doing work in China, and to act with the boards in any measures which they may adopt.

It should be pointed out that some of the boards have had already in force policies which cover most or all of the points enumerated in the foregoing resolutions.

As an example, the plans of the Methodist Episcopal, North, board may be mentioned. In this board there is a medical department headed by a returned medical missionary, Dr. J. G. Vaughan. The health policy of the board includes, besides other lesser items, the following: A thorough physical examination of candidates made by certain, well-trained, well-paid examiners in various centers in the country; examination blanks made in quadruplicate and a copy sent to the physician on the field; a health efficiency study based on health reports received trimesterly from each missionary on the field; a card index with complete health record of each missionary; the issuance of Life Extension Institute Bulletins; typhoid inoculations every two years; and supervision of activities of missionaries on furlough with special reference to the requirements of health. This policy was adopted two years ago.

The policy also recognizes the importance of co-operation between boards in such common problems as proper examinations, health surveys, etc., but unfortunately little in this line has been accomplished. The writer understands that in this respect British societies are considerably ahead of American societies.

The Young Men's and Women's Christian Associations, though they have no practicing physicians on the field, are particularly careful concerning examinations, requiring yearly physical examinations on the field and such a thorough overhauling as is given at the Mayo Clinic when on furlough.

Certain other boards take a lively interest in the health of their workers. Yet, considering China as a whole, as this study does, it is evident that many of the boards are far too lax. In order to gain an idea of the thoroughness of the attention paid to the physical life of the successful candidate, a brief questionnaire was circulated in January, 1920, among the students of the North China Union Language School.

Sixty-eight adults, all but two of whom had come to China within a year, filled out the question blank. Fifteen mission boards were represented. Of these 68, 30% had been examined by doctors of their own selection, 23% had been given no advice concerning the maintenance of health on the field, 20% had not been inoculated against typhoid fever, 6% had not been vaccinated (none of these were protected by recent vaccination), 9% had not had their urine examined. All but one had had a chest examination. Most of the neglected cases belonged to a certain few of the boards.

5. *Co-operation Between Boards.* There are certain measures which individual boards cannot put into operation, at least not without wasteful duplication of effort and expense. The most important word in the C. M. M. A. resolutions is "co-operative." Not only at home (in ways suggested in the above-mentioned policy), but also on the field, more active co-operation is possible. For example, this study shows

the overshadowing importance, even in the families of the medically trained, of the intestinal infections, dysentery, diarrhœa, cholera, etc. For the prevention of these diseases better sanitation is essential. But the sanitation of mission stations and Chinese cities cannot be directed from New York, London, Stockholm, and Copenhagen. Missionary doctors have neither the time nor the special training for this.

There is needed a staff of health officers and sanitary engineers on the field, working under some union body such as the Joint Council on Public Health or the China Continuation Committee. Such a staff could compile vital statistics for the whole missionary body, advise stations and summer resorts concerning sanitation, provide vaccines, conduct researches into the problems of health and promote public health measures among the Chinese in the cities in which missionaries reside.

As an instance of a minor problem in which missionaries can be helped, the following example is mentioned:

At the Peking Union Medical College, under the leadership of Dr. J. H. Korns, 400 servants in the families of missionaries and other foreigners have been examined for chronic communicable diseases. Eleven per cent were found to have a positive blood test for syphilis, 11% had trachoma, 48% round worms, 1.8% hook worms, 1.7% were meningitis carriers, and 1.2% diphtheria carriers. Through treatment of servants who are diseased, through lantern lectures on home sanitation, as well as through the emphasis placed on good health, it is felt that the danger of infection from household servants in Peking is considerably lessened. For those employers whose servants have been found free of infectious disease, one cause of worry is removed.

Because of the necessity of using boiled vegetables and milk, and expensive butter, the supplying of the growing child with a properly balanced diet, containing necessary food elements, is a problem. (121 cases of difficult feeding and malnutrition and 13 cases of rickets were reported, but no case of scurvy.) Wilson,[36] and Adolph and Kiang[37] are studying the nutritive value of Chinese foods. Taylor[38] has presented work on the feeding of the foreign baby. Mills[39] has pointed out the value of chloride of lime for the sterilization of water in country traveling. Van Buskirk[40] has made a thorough study of the climate of Korea with reference to its effect on foreigners. The practical applications of these studies,[41] and many others which should be undertaken, should be placed in the hands of all missionaries, either directly or through a column in the Chinese Recorder.

For large undertakings, such as the building of schools, the institution of more complete sanitary measures in cities and at so-called health resorts (which are often the playground for epidemics), for effective protest to operators of

river steamers, etc., there should be active co-operation between the missionary body and the rapidly growing group of non-missionary foreigners doing business in China.

### THE EXTRAVAGANCE OF SICKNESS

Back of mission boards lies the contributing church, a church which seems sometimes to give best when its missionaries are represented as suffering most of physical privation and hardship. In order that the boards may not be hampered in adopting "energetic, co-operative, comprehensive" health policies, there is need for an increased interest of the church in the physical welfare of missionaries and a realization of the fact that maintenance of good health is good economy. For this reason the facts of this study are not kept secret. Sickness anywhere is expensive, but when the sick one or his successor has to be sent 10,000 miles, it is an extravagance. Things that make for health are not luxuries, but money-saving necessities.

Modern preventive medicine has shown that, to a large extent, good health is purchasable. Pittsburgh,[35] for example, has bought more than 300 lives a year (formerly taken by typhoid fever) by the erection of a $5,700,000 water filter plant, and considers the purchase a bargain. No man of business would spend several thousand dollars for an automobile and then let it go to the junk pile for lack of oil or for neglect of necessary repairs. Neither would the contributor to missions, if the matter were presented to him, after spending a like amount for sending a family to the field, object to the additional expenditures necessary to keep it in health. Vaccine, wire screening, proper medical advice, sanitary dwellings, adequate salaries, vacations, health surveys, etc., are expensive, but not so expensive as sickness.

It has been figured by a leading statistician that the periodic examination of any group will save at least three lives per thousand per annum, apart from the dividends in increased health. If this is true, 20 lives a year would be saved to the missionary force in China through this one means. At the usual valuation of life, this would save at least $100,000 a year. Since some of the boards already provide for regular examinations (usually only at the time of furlough) a yearly examination would not reduce mortality to the extent named. However, it should save $40,000-$50,000, which would more than pay the expenses of a dozen additional doctors to conduct the examinations.

The purchase of health, like any commodity of value, requires careful planning and the aid of expert advice. The employment of a staff of experts such as has been suggested, would, in the course of a few years, save hundreds of thousands of dollars now wasted in poor health and death.

Such intelligent, scientific supervision of health would increase morale and make it easier to secure recruits among those who hesitate to expose children to the hazards of missionary life. A missionary is not afraid of death, but he would rather be killed in battle, than tamely fall a victim of some easily preventable sickness.

## SUMMARY

This is a study of facts concerning the health of 60% of the missionary families in China. Facts are tabulated concerning 1,300 marriages, and 4,831 persons (1,577 adults and 3,254 children). Facts concerning 451 deaths of children, 59 stillbirths and 416 miscarriages and nearly 7,500 cases of sickness are analyzed. The study represents a total of more than 35,000 years spent in China. The principal facts which have come to light are as follows:

1. Each marriage has resulted in an average of 2.5 children, which is at least 20% more than that for the average college graduate or college teacher in the United States. Only 13% of the marriages are childless, against 31% among American college women.

2. American societies average 2.33 children per marriage, English and Canadian, 2.63; European, 2.88.

3. Three-fourths of the families have no children dead.

4. The children average 8½ years in age, 67% of their time has been spent in China. Ten per cent less time has been spent in Southern than in other provinces.

5. Mortality amog these children is considerably less than half what it is among Chinese children, but 1½ times greater than among children of missionaries in Japan. (139 in China to 95 in Japan.) The excess for China occurs in the group of children aged 1 to 5 years.

6. Infant mortality is only 60. The rate for the first six months is extremely low, lower than among professional men in England, but during the last six months it is two to three times as high, due largely to dysentery and other intestinal infections, which are, in turn, probably due to lack of breast feeding.

7. Death rates of children from the second to the fifth years are three times as high as in country districts in England having about the same infant death rate.

8. Mortality, in general, decreases from north to south. It is more than twice as high in North China as in South China. This is due both to the greater prevalence of the infectious diseases, and to the larger percentage of deaths among those taken sick. Intestinal and respiratory infections and smallpox are most markedly deadly in the north. Considering the societies individually, most of them show higher mortality rates in the north than in the south.

9. Mortality varies markedly in the various societies, the highest having three times the rate of the lowest. High rates are due to the general infections and intestinal diseases. Rates are higher in societies having the larger number of children per family.

10. Mortality is higher in the societies reporting less than 20 children.

11. Mortality is equally low in American and English societies, the high rates found in European societies are due to dysentery, diarrhœa, and smallpox, each of which is two to four times as deadly as in American or English societies.

12. Mortality is lowest when a parent is born in China, highest when parents are born in Europe. Of the latter class, 15% of the deaths are due to smallpox.

13. Mortality is lower in families where parents have had medical training, largely because of the decrease in general infectious diseases. Training of the mother is of more importance than training of the father, as shown by decrease in intestinal and general infections. This points to the advantage of education of the mother in home sanitation.

14. Mortality is, in general, lower in societies having the larger ratio of doctors to missionary force.

15. The decrease of mortality in the more recent years has probably not exceeded the rate of decrease in England and America. Infections other than dysentery have decreased most.

16. Mortality has decreased for successive children through the fifth child, after which it has increased. Smallpox is six times as deadly among children born sixth or later, while dysentery is less deadly.

17. Large families have a considerably higher rate than small families. This is due to the general infectious diseases, including smallpox, and diarrhœa. This points to poor quarantine within the home.

18. Mortality rates are slightly lower for children born outside of China than for those born within. They are lower in the groups of societies in which parents have spent the largest percentage of time off the field.

19. Dysentery has caused 19% of all deaths, diarrhœa 12%, respiratory infections 13%, diphtheria 6%, conditions associated with birth 10%, smallpox nearly 5%; 88% of deaths have occurred before the age of seven.

20. Compared with the United States and England, dysentery, smallpox and injury at birth take a large toll for the first five years. After five years, scarlet fever is relatively deadly. The early appearance of typhoid (7.5% of deaths from 5-9) points to the need of early inoculation.

21. Less than 7% of deaths occurred in the homeland; 33% of the time was spent there.

22. Of the children dying aged five years or over in four groups of societies, one-third were killed in the late war.

In general the various tabulations show that infant mortality is much less variable than mortality of childhood, also that rates due to birth, development and nutrition vary less than those due to infections. Since the diseases whose rates fluctuate most are most preventable, effort directed against the infectious (bacterial) diseases of early childhood will yield the largest returns.

23. Sickness rates, in contrast with mortality rates, are highest in Central and South China, due to increase of malaria and intestinal parasites. In South China also, fewer children have robust health. Dysentery in relation to years of residence is less prevalent in the coast and Yangtse valley provinces. The absolute number of cases is greater in these sections because the number of missionaries is greater.

24. Scarlet fever, measles, mumps, chicken pox and whooping cough are contracted relatively more frequently outside of China than are the less highly infectious diseases.

25. The largest number of dysentery infections occur during the second and third years, of diarrhœa during the first and second. The younger the child, the higher the mortality.

26. Miscarriages number 13.4% of live births, the rate being highest in South China. The number of miscarriages per family is also highest in the south. 24% of the wives have had one miscarriage or more, a comparatively high rate. 87% of miscarriages occurred in China, against 82% of married

years spent there. Travel and overwork caused a larger proportion of miscarriages at home than it did in China. Overwork, disability, nervousness, etc., are thought to be responsible for one-half of the miscarriages.

27. Stillbirths were 1.84% of living births, a low rate, probably largely due to the absence of syphilis among missionaries.

28. Missionaries have been married an average of 11.6 years. The average adult life on the field is 20% less in South China than in North China. 55% have been in China 10 years or less.

29. Most numerous diseases among adults in China in order of frequency are: malaria, dysentery, typhoid, nervous breakdown, influenza, diarrhœa, sprue, appendicitis operations, smallpox, typhus fever, tuberculosis. Central and South China show larger numbers of illnesses than North China.

30. Cases of malaria and dysentery are much more numerous among husbands than among wives. In the case of sprue, the reverse is true.

31. Forty-six per cent of the infections are contracted within the first three years after arrival in China.

32. More than half (53%) of adults have had serious illness in China. Fewer have been sick in North China than in Central and South China. The rate is the same for husbands and wives.

33. Only 20% of wives and 30% of husbands say they have been in robust health. For wives, the proportion is constant for the sections of China. For husbands, 33% in the north have had robust health, against 17% in the south. This is perhaps due to the especially high incidence of malaria among husbands in the south.

34. The proportion having robust health in various societies varies widely, but in general, the societies with high mortality rate among children have a low percentage of robust health among parents. In general, though mortality among children is much higher in the north, the morbidity rate among adults and children is less, miscarriages fewer, the general health better, and the residence in China longer for those who live in North China. This is because the diseases of North China (dysentery, pneumonia, diphtheria, scarlet fever, smallpox) cause death. Those of South China (malaria, intestinal parasites) and the climate, cause invalidism.

35. Three-fourths of the deaths of children are due to infectious diseases, for which the ratio of preventability is high. Given knowledge and command of preventive measures, it is possible to save 200 of the 300 deaths from the infectious diseases here recorded.

36. Among adults and children here reported (about 41% of the total missionary body) dysentery has caused 808 cases of sickness and 84 deaths.

37. If the typhoid fever rate were reduced to that prevailing in the United States army since the introduction of compulsory inoculation, in ten years on the field there would be a saving of 56 lives and $336,000. Typhoid contracted by adults in China outnumbers cases contracted by them at home 12 to 1.

38. One hundred and eleven cases of smallpox, with 28 deaths, are recorded among children and adults, a rate 95 times that for the general population of the United States. No deaths have occurred in families in which parents have had medical training. In 51 cases in which the record of vaccinations is known, six cases occurred in individuals who had "takes" within five years, pointing to the need of more frequent vaccination. Only one death occurred in a person who had been vaccinated. Cases of smallpox contracted by adults in China outnumber cases contracted at home 30 to 1. Among the children, no case contracted outside of China was reported.

For some of these conclusions, modifying sources of error, which have been named, should be noted. A closer comparison of facts will be possible when statistics now being collected among missionaries in Japan and church members in America have been tabulated.

In certain sections of China, or among certain groups, children of missionaries have as good a chance for life and health as children at home. Taking the missionary body as a whole, however, there has been an excessive loss of life among both children and adults. Much of this loss may in future be prevented. For such prevention, both intelligent vigilance on the part of the individual and a larger co-operative health program on the part of the churches is needed. Increased expenditure, if based on facts, would result in great money-saving, and would aid in bringing nearer the longed-for coming of the New Day to China.

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